The objective of the FAO crops programmes is to improve food security by encouraging farmers to adopt improved high yielding varieties of cereals, particularly wheat, and to hasten self-sufficiency. The major emphasis of the agronomy programme is the introduction of the new technology through training and extension based on demonstrations in farmers' fields.

Encouraging farmers to adopt new crop varieties - farmers field demonstrations

In the period 1995-1997 the use of high yielding varieties was demonstrated in 175 farmers' fields in 17 provinces. The objective was to compare farmers' practice with an improved practice and a recommended practice and to demonstrate the advantages of timely agronomic practices in cereals featuring improved varieties: planting time; spacing; fertilizer use and application; irrigation; roguing; weeding and harvesting. Farmers claimed it was practically impossible to use different land preparation methods on small plots, hence all plots underwent the same pre-planting land preparation. In many cases farmers also refused to remove weeds from the land at the optimum time, claiming that they did not need the uprooted weed for fodder at that time. The results of these demonstrations showed that Afghan farmers are good wheat farmers and that the improved varieties used with adequate fertilizer can increase yields by 40 to 150 percent. The use of fertilizer at optimum rates to obtain maximum yields is currently unsustainable because only small amounts of fertilizers are available in the bazaars.

Irrigated wheat demonstration plots using Higher Yielding Varieties 1996/1997 - yields kg/ha

Average Yield Irrigated Wheat Local Variety	HYV + Farmers Practice	HYV + Improved Farmers Practice	HYV+ Recommended Practice	Highest YV + Recommended Practice
1,672	4,097	4,359	4,713	7,456

In the 1997/1998 season a three-plot design was used to compare two high yielding varieties employing recommended practices and the local variety using local husbandry practices. It provided farmers with a chance to compare characteristics and yields of three varieties and a choice as to whether to use fertilizer or not. The results of 104 field demonstrations (FFDs) in PEACE initiative areas are shown in the table below. It is generally agreed that a Value:Cost ratio of 2.0 is the minimum necessary to attract farmers to fertilizer use. When good quality fertilizer is available in Afghan bazaars farmers will certainly buy it thus improving their income and food security.

Average yield in kg/ha of wheat grain from Farmer Field Demonstrations - 1997/1998.

Location and number of FFDs	Local Practices: Local Variety	Improved Practices: Bakhtawar-92	Improved Practices: Pamir-94	Value of best yield increase USD per ha	Cost of Inputs USD per ha	Value:Cost ratio
Qandahar (48)	2,580	2,848	3,332	146.64	63.25	2.32
Farah (46)	2,486	3,736	3,400 (Pak-81)	243.75	63.25	3.85
Azra/Tezin (19)	1,546	1,651 (Attaya)	2,338	154.44	63.25	2.44

Application rates per ha: Seed 130 kg; DAP 100 kg; Urea 100 kg

For the 1998/1999 season farmer's field demonstrations were established again using a three plot design and with each plot given an area of 200 square metres. The local varieties employing local husbandry practices were compared with two higher yielding varieties using recommended practices. In the PEACE districts concentrated on Qandahar and Farah a total of 72 FFDs were established in 11 districts. The results of this work were inconclusive due to insufficient supervision during the growing period.

IRRIGATION

Introduction

Irrigation is a necessary complement of cultivation to maximise the productivity of agricultural land. It is difficult for refugees to make a sustained return to their formerly highly productive land, even when all the land mines have been removed, if all the irrigation structures are in ruin. In all parts of Afghanistan, irrigation systems and related structures have been destroyed and washed away over the last 20 years of war and neglect. As a result some of the best agricultural land is not being utilised or not utilised to its full potential. The results of the FAO horticultural survey (published in 1999) show that in 1997 73% of villages suffered from a shortage of irrigation water due to destroyed irrigation structures or poor water management. Whilst much rehabilitation work has taken place since 1997 it is still believed that shortage of water is a major factor in the general disruption of agricultural productivity and the account of the work in Azro and Tezin, given below, could be repeated in most districts of Afghanistan.

FAO has had an irrigation unit since 1990, established in Peshawar. The unit is concerned with flood protection and watershed management, but its essential function is the promotion of technical standards and the rehabilitation of irrigation structures in order to sustain the livelihoods of farmers and the return of refugees, to reduce their dependence on food aid.

The long-term objective is to redesign and reconstruct damaged irrigation systems bringing all available agricultural land back into cultivation. However, rehabilitation of traditional irrigation systems is not just about redesigning and building concrete structures it is also concerned with the efficient use of water at farmer/community level. Many of the old traditional skills have been lost so the unit also concentrates on training and retraining local mirabs (water bailiffs) and key farmers in the efficient use of water to improve the productivity of agricultural land.

The FAO irrigation unit is backstopped by an international consultant irrigation specialist who gives technical guidance, monitors activities, evaluates proposals and liaises with potential donors and co-operating agencies such as WFP; OPS; CHS(Habitat) and UNDCP for whom the FAO irrigation unit is frequently used as a technical consultant. The unit is technically excellent and its potential is fully realised in schemes like the group repatriation and sustained return of refugees, where work of a high standard, to rehabilitate and rebuild structures and systems is required, supported by training the community to manage its water resources efficiently.

Project implementation

To implement irrigation projects NGOs are contracted as implementing partners. The contracted NGO is selected based on technical competence and the ability of its professional staff to carry out and manage the implementation of projects. NGOs are chosen from those who have worked in the area previously and have good local knowledge and from those that have worked successfully with FAO in the past. An engineer, employed by the implementing partner, reporting to the FAO monitoring engineer is stationed on site until the work is completed.



Plate 10
Desilting a wash
Tezin, Kabul



Plate 11
Flume
Azro, Logar



Plate 12
Bank protection
using Gabions
Tezin, Kabul

Irrigation projects and the rehabilitation of traditional irrigation systems

Group repatriation of Afghan refugees in Pakistan is a UNHCR initiative supported by the Government of Japan in Azro district of Logar province and Tezin, a village of Sarobi district in Kabul Province. Both are remote locations to which refugees have returned under the group repatriation scheme. FAO (1997-98) in co-operation with OPS was funded by the Government of Japan to rehabilitate the traditional irrigation systems More than 600ha of land have been brought into service or rehabilitated and flood protection structures rebuilt benefiting an estimated 6,500 families (over 45,000 people). Additional sub-projects have been proposed.

Tezin is a village at an altitude of 2,000m. Fighting spread to the area at the beginning of the war, communities left as refugees for Pakistan and the area has been largely unoccupied ever since. Over the last twenty years flooding of the local river has washed away the banks of the wash (flood channel) and with it the topsoil of the agricultural land of Jalobi and Khas Tezin. The rehabilitation and re-channeling of the Jalobi wash was proposed.

The eroded agricultural lands and the original channel of the wash were surveyed. For flood protection the wash was desilted and new embankments constructed. As a result of this flood protection farmers were able to return to their lands and start cultivation. In addition, the construction of two flumes (aquaducts) and a culvert brought tracts of 95ha and 50ha, respectively, back into irrigated cultivation. A leaking retaining wall of one canal was replaced with a gabion wall and three gabion dikes were constructed to protect agricultural land under threat of flooding.

In **Azro** district three washes (Lakhmiray, Shoblay and Khoday Wahale) were desilted and new embankments constructed for each of them. Under this project 800ha of agricultural land have been protected from flood damage and about 200ha of arable land brought back into irrigated cultivation. Two flumes have been constructed to irrigate about 60ha and the supply of irrigation water to further tracts of arable land has been facilitated by the construction of a culvert across a wash.

In **Zormat** district of Paktya province a project funded by UNOCHA, to rehabilitate traditional irrigation systems and bring into service or rehabilitate a total of 7,600ha of agricultural land benefiting some 1,000 families, was successfully completed in 1999.

Other activities

- As part of the programme to eradicate poppy FAO irrigation experts were seconded to UNDCP to make assessments of the Helmand and Nangarhar irrigation systems. A plan for the rehabilitation of the Nangarhar system was prepared by FAO and implemented by UNDCP.
- During 1997, the irrigation unit published two technical working manuals in local language for use by Afghan irrigation engineers: 'Construction Materials' and 'Water Harvesting' adding to earlier technical manuals published in the same series on irrigation topics.
- The project funded an 'on-job' ten day training course for irrigation engineers and agronomists attached to FAO and OPS on 'Irrigation Water Management'.
- All of Afghanistan's meteorological stations have been destroyed and without monitoring devices it is impossible to estimate the abundance of irrigation water available to farmers. In Jalalabad, the first of six planned meteorological stations has been constructed.

Opportunities for 2000 and beyond
The FAO unit, through application of its technical expertise in planning and designing irrigation projects and in the rehabilitation of traditional irrigation systems, has shown it can play a significant role in the sustained return of refugees to Afghanistan under schemes such as the HCR initiative of group repatriation.

With sufficient funding the unit could have a major impact on the efficient use of water at farmer/community level and thus on the productivity of agricultural land.

CROP IMPROVEMENT

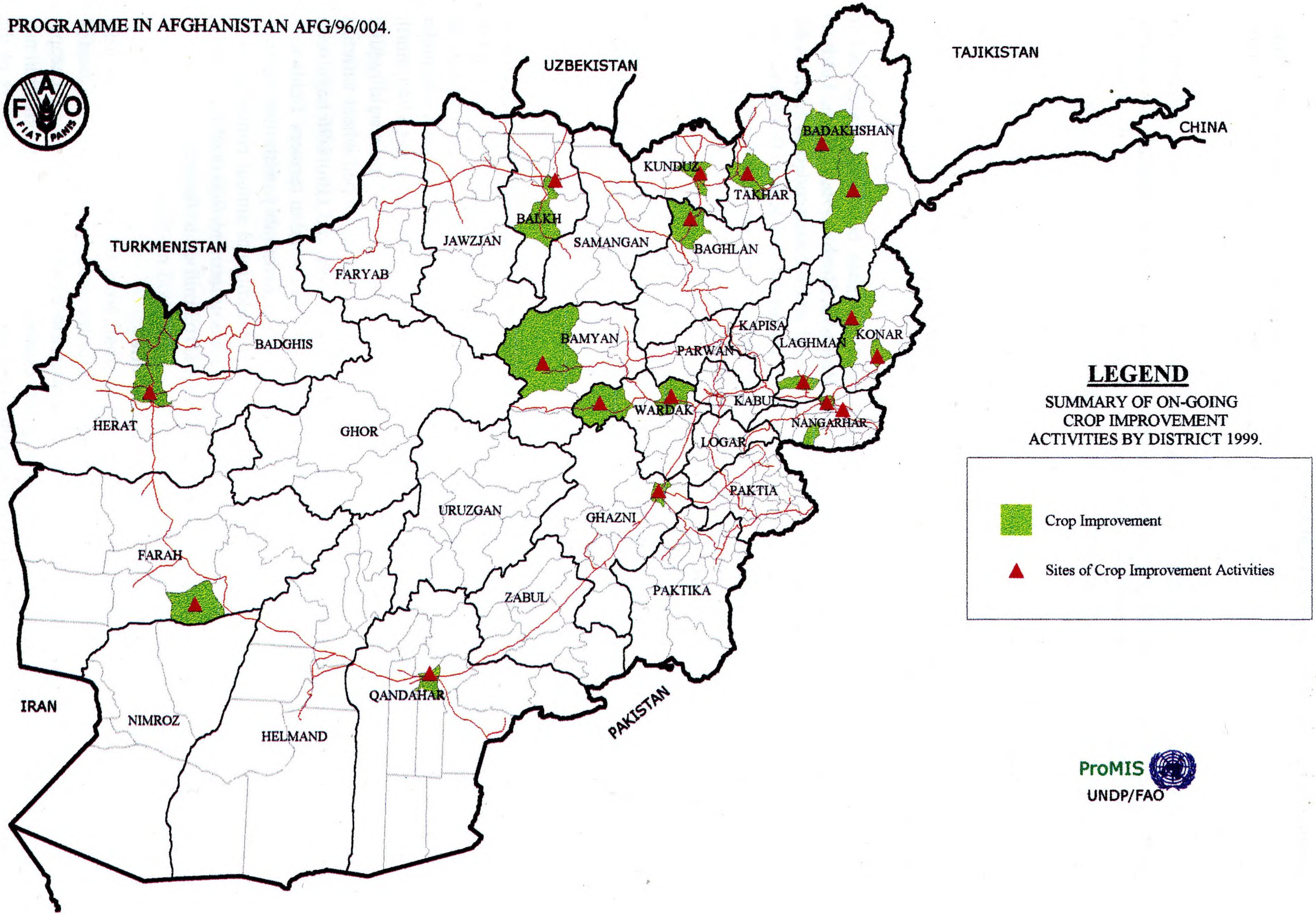
Introduction
Disease organisms reproduce and evolve at significantly faster rates than crops consequently, mutant virulent strains of disease organisms apply a constant pressure on the plant's resistance mechanisms which withstand disease attack. For example, resistance to rust disease in wheat is generally expected to break down in about five years. When resistance does break down it can lead to spectacular 'crashes', as happened in Afghanistan in 1997 and 1998, when large areas planted with a single variety of wheat were affected by rust disease and a significant reduction in yield resulted. Plant breeding is the essential tool to overcome the degeneration of a plant's resistance to attack by pests and diseases and to maintain the productivity of agricultural land and, hence, the food security of a nation. The release of a new variety for use by farmers is the final stage of a plant breeding process and selection procedure that may take many years and cost many millions of dollars and which provides the only sustainable solution to food security.

In 1996 with the financial support of SIDA, the crop improvement component of the FAO crops programme was launched in six agro-ecological zones based on Balkh, Takhar, Herat, Qandahar, Ghazni, and Nangarhar. (North, North Eastern, North Western, South, East Central and Eastern Afghanistan). Since then the programme has succeeded in the introduction and release of new varieties of wheat (*Triticum aestivum*), durum wheat *(Triticum durum)*, rice (*Oryza sativa*) and barley (*Hordeum vulgare)*, work has also been done on wheat agronomy. In addition, varietal screening work has been conducted on lentil (*Lens culinaris*), chickpea (*Cicer arietinum*), beans (*Phaseolus vulgaris*), mung bean (*Vigna mungo*) and pea (*Pisum sativum*).

The objective of the crop improvement programme is to improve food security by increasing the productivity of agricultural land. This is achieved by testing and selecting varieties of 'improved' crop plants (cereals, vegetables and some leguminous crops) that are high yielding, pest and disease resistant and suitable for Afghan conditions. Selections are made from germplasm received from plant breeding programmes of international research centres and local sources. Genotypes proven to be high yielding and to have other desired characteristics such as disease resistance and stress tolerance are recommended as improved varieties. Early generation seed (breeder nucleus and pre-basic) of the newly recommended genotypes is then passed on to the seed production element of the FAO programme for multiplication and distribution to Afghan farmers as 'Quality Declared Seed' (QDS) of 'improved' varieties. Afghanistan has many diverse agro-climatic zones and thus in addition to selection based on yield and disease resistance, varieties are also selected for characters conferring adaptation in each zone, for example, cold tolerance, short maturation cycle, grain colour, shattering resistance and drought tolerance.

FOOD SECURITY THROUGH SUSTAINABLE CROP PRODUCTION

PROGRAMME IN AFGHANISTAN AFG/96/004.



Results of testing new varieties of Wheat

Wheat is the staple food crop in Afghanistan with a per capita annual consumption of 180 kg. Irrigated wheat provides 69% of total wheat production the remainder is produced under rainfed conditions.

In 1997-98 crop season 941 wheat genotypes were tested. A total of 174 were selected for further evaluation in 1998-99 crop season and these were planted in 15 trials in 10 locations throughout the country. In addition, the project has received from CIMMYT, ICARDA and NARC-Pakistan 816 wheat lines and planted them in nine yield trials and in observation nurseries.

Common, loose and dwarf bunt diseases cause significant loss of yield and reduce bread quality in North, North East and North Western parts of Afghanistan. A screening trial, to test for bunt tolerance, consisting of 400 different wheat lines was planted in Kushk district of Herat province. Resistant lines were identified in 1999 and these are now undergoing further testing to compare yields.

The screening of varieties grown under irrigated conditions has been very successful in releasing new genotypes. Facultative wheat varieties **Rana-96, Roshan-96, Gul-96, Takhar-96, Amu-99, Herat-99** and **Mazar-99** have been released and recommended to farmers for production under irrigated conditions and together with **Pamir-94** and **Kauz** (Bakhtawar-92) constitute a very good mix of wheat varieties for the diverse agro-climatic conditions over the entire country. Data has shown that these genotypes are out yielding the previously introduced wheat variety of Pirsabak-85 by 9-30% and remain resistant to the prevailing races of stripe rusts in Afghanistan. The value of these yield increases are USD216-360 per hectare and would significantly contribute to food security and poverty alleviation. If 60% of the irrigated land was sown with these varieties there would be an extra 1.95m MT food grain produced annually. This extra wheat has a value of USD351m and could sustain an extra ten million people.

On farm water management, water use efficiency and the quantity and seasonal distribution of precipitation are factors limiting crop productivity in Afghanistan, where 50% of the arable land is classified as rainfed. In 1993, DAI (Development Alternatives Incorporated, an American consultancy company) reported that the proportions of arable land cultivated under rainfed conditions were as follows: northern zone (75%), north eastern zone (67%), north western zone (50%) and the southern zone (13%). To irrigate this rainfed land would require huge investment of capital. The crop improvement programme has developed wheat varieties that are tolerant to water stress and two wheat varieties **Dayma-96** and **Ghori-96** have been released and recommended to farmers. The yields obtained in trials and in farmers' fields with Dayma-96 (2,076kg/ha) and Ghori-96 (962kg/ha) compare favourably with the national average yield for rainfed wheat of 740kg/ha. The potential additional annual contribution of these varieties to national production in the rainfed areas is around 900,000MT (able to sustain an extra 5 million people) and worth an extra USD162 million to farmers.

Early generation seed production of new wheat varieties

The selected lines or varieties of wheat are planted in small areas for multiplication in order to obtain breeder nucleus and pre-basic classes of seed for the seed production component of the FAO programme for further increase and distribution to farmers. This is much cheaper than importing large quantities of breeder seed and is essential for the timely production and distribution throughout the country of high quality seed to all implementing partners of the

seed production programme. Imported seed costs more and can inadvertently bring with it, pests and diseases not present in Afghanistan.

In 1997-98 crop season, the project produced 32.4MT of early generation seed of seven new varieties of wheat and in the fall of 1998 a further 36.3MT of eleven top yielding wheat varieties was produced in six zones. Of this total, 8.3MT of one variety Takhar-96 was exchanged between farmers and the remaining 60.3MT was distributed to farmers either directly by the project or by implementing partners. Some 502ha of land have been planted at a seed rate of 120kg/ha. At an average yield of 3.0MT/ha it is expected to harvest over 1,500MT of 'quality declared seed' in 1999. In the 1998-99 crop season the project produced 84MT of foundation seed of selected improved varieties which will be distributed to NGOs, the seed multiplication element of the FAO programme and to contracted farmers to produce 'quality declared seed'. This seed will be available to farmers for sowing in autumn 2000.

The impact of these varieties is impressive. In 1997 the project distributed 2.3MT of seed of the variety Takhar-96 to farmers and in 1998 the farmer to farmer exchange of this variety was 32.8MT. This exchange is in excess of what the farmers may have kept for their own planting requirements. Similarly, 1.4MT of the variety Dayma-96 was distributed and the subsequent farmer to farmer exchange was 10.8MT. In 1999 these varieties out yielded the local ones by more than 300%.

The conclusion of the 1998 FAO/WFP Crop and Food Supply Assessment Mission was that there was an overall increase in cereal production to a total estimated at 3.85 million MT. The wheat component of this estimate was 2.83 million MT. The 1999 survey estimated that due to drought and substitution of wheat with cash crops (licit and illicit), wheat production would be about 300,000MT less than in 1998. The adoption by farmers of improved high yielding varieties of wheat will hasten self-sufficiency.

Wheat agronomy - optimum sowing date

Shortages of labour, beasts of burden, tractors, threshers and other farm machinery delay the preparation of land and prevent the timely transition from one crop to the next. A series of trials established optimum sowing dates for facultative wheat grown at different altitudes. At low altitudes, for example the provinces of Balkh, Herat, Qandahar, Kunar, Laghman and Nangarhar the optimum sowing date was mid-November. Delaying planting by fortnightly intervals from the end of November to mid-January resulted in yield reductions of 17, 20, and 40kg/ha per day.

At higher altitudes, for example, in Ghazni, Bamyan, Ghor and Badakshan provinces, the optimum sowing date is mid-October to the end of November. Delaying planting after November resulted in yield losses of 258kg/ha per day.

Results of testing new varieties of Rice

Rice is an important crop in the North Western, Northern, North Eastern and Eastern parts of the country. Research on both short and long grain varieties of rice has been carried out in each of these regions.

Short grain rice

In varietal screening trials **Swat-2** with an average yield of 7MT/ha over 17 locations has out yielded the local variety by 30% and is being widely adopted by farmers.

Plate 13
Wheat - Farmer's
Field Demonstration
Bamyan





Plate 14
Wheat
Variety Trial
Preparation
Herat

Plate 15
Wheat
Variety Trial
Bamyan





Plate 16
Wheat Variety Trial
Nangarhar



Plate 17
Food Legume Trial
Nangarhar



Plate 18
Training
Wheat Diseases

CONTENTS

Medium grain rice

The line RP1670-7613-3-2 is top yielding with an average yield of 6,776kg/ha calculated from all years and all locations. It has out yielded the local rice variety by 41%. This line has been named **Afghan-98** and is being recommended as a new variety. In 1998 the project produced and distributed 6.2MT seed of this variety and in 1999 more than 3.0MT of pre-basic seed of this variety has been distributed to farmers in Takhar, Mazar-i-Sharif, Kunduz, Baghlan, Nangarhar and Herat for multiplication. This variety out yields local varieties by 1,750kg/ha worth about USD312 per ha.

Long grain rice

The line IR62871-166-2-2 produced an average yield of 5,865kg/ha over 17 locations. This is the top yielding long grain rice line and has produced 22% higher grain yield. This line has been named as **Baghlan-98** and is recommended as a new variety for use by farmers. In 1998 the project produced and distributed 80kg seed of Baghlan-98 to farmers in Takhar, Kunduz and Baghlan provinces for further multiplication. The yield of this variety in farmer's fields was 6.3MT per ha in 1998. In 1999 the project has distributed 2.0MT seed of this variety to 15 farmers in Takhar, Kunduz and Baghlan provinces. Baghlan-98 out yields the current improved rice variety (Basmati-385) by 1.0MT per ha which is worth an extra USD212 per hectare for farmers.

All these rice varieties are early maturing and have very good cooking quality. The potential of these varieties to increase national rice production is about 234,000MT annually, worth about USD62 million extra income for Afghan farmers.

Results of testing new varieties of Maize

For high elevation areas such as Ghazni, Logar, Wardak, Kabul, Kapisa and Parwan provinces the varieties EV-II and Shaheen gave the highest yields producing 111% and 104% higher yields than the local variety. For warmer areas, the variety Azam gave 60% higher yield than the local variety.

However, varieties Kissan, Sarhad Yellow and Sarhad White showed a wide range of adaptability and performed well in both high and low elevation environments out performing the local varieties by 65%, 60% and 22% respectively.

In 1999 new germplasm was received from CIMMYT and planted in Nangarhar and Qandahar provinces for the selection of high yielding varieties suitable for Afghanistan.

Results of testing new varieties of Barley

Barley is used as a food crop in some areas, but more commonly is widely used as fodder for animals. Three years data of trials of six-row barley was analyzed for the identification of barley lines suitable for release as new varieties. Two lines have been named as new barley varieties for release in Afghanistan **Hewad-98** and **Watan-98** and are recommended for seed multiplication in 1998-99 crop season.

The project has produced and distributed 1,526kg seed of Hewad-98 and 608kg seed of Watan-98 for pre-basic seed production in Herat, Balkh, Takhar and Qandahar provinces. This amount of seed is enough to plant 34ha of land and is expected to produce 68MT of seed in the 1999 harvest.

Results of testing new varieties of Food legumes
Food legumes are important sources of vegetable protein and are of special importance in food deficit areas where malnutrition is a common problem amongst the most disadvantaged groups of people. The project has screened germplasm of beans, chickpea and lentils for adaptability and yield in different parts of the country. More funds are required to continue this work.

Beans .
The top yielding kidney bean varieties were:

- ♠ 5229 UI with bush type growth habit
- ♠ Arapaho, a pinto climbing type
- ♠ Co 1760, a great northern type with bush growth habit
- ♠ Viva, a pink colored bean with bush type growth habit.

Their yield is 56%, 50%, 41% and 75% higher than the local beans. These top yielding lines are being considered for seed multiplication and distribution.

Chickpea
Two lines (FLIP 93-58 and ILC-482) have been identified as top yielding, cold and *Ascochyta* blight tolerant and are being multiplied in Tahkar, Balkh and Herat provinces for early generation seed production. Their yields are 52% and 14% higher than the local varieties.

Small scale seed increase is being pursued and small quantities of seed of these lines have been given to farmers in Mazar, Baghlan, Kunduz, Takhar and Badakhshan provinces. However, there is an urgent need to multiply these varieties in the food deficit areas.

Lentil
Two lines (78S 26002 and FLIP 92-15L) are highest yielding and have been recommended for multiplication in Herat, Balkh and Takhar provinces. These varieties out yield local varieties by 23% and 21% respectively.

Cooperation with other components of AFG/96/004
The project has produced in the past two years 120MT pre-basic and basic seed of different wheat varieties and 5MT of barley seed for multiplication. The project has given 62MT of this seed to the seed production component of AFG/96/004 for increase in 2000. Similarly 2.5MT seed of mung bean (variety Niab-92) has been given to the seed project for multiplication in different parts of the country.

In Nangarhar and Herat provinces vegetable seeds have been produced and distributed to hundreds of farmers in collaboration with the horticulture component: 124kg broccoli, 6kg turnip, 25.5kg onion, 3kg squash, 40kg okra, 5kg carrot, 6kg spinach, 3kg dill and 3.6kg radish. The impact of this work is in kitchen garden programmes and in the training of a corps of specialised farmers to produce vegetable seeds of very high quality. Observation trials of different vegetable varieties have been set up to identify those varieties suitable for use in the different agro-ecological zones of Afghanistan. Also in collaboration with horticulture the crop improvement component is growing micro tubers of 15 varieties of potato in Qandahar, Kunduz and Nangarhar.

Plate 19
Germplasm
erosion





Plate 20
Cataloguing varieties
Almond flowers

Plate 21
Cataloguing varieties
Pomegranate fruits



The collection and preservation of indigenous germplasm
The preservation of plant biodiversity, particularly relating to crop plants, is important for the future of food production throughout the world. This germplasm is the plant breeder's raw material acting as the pool of genes from which new 'improved' varieties obtain their desirable traits: resistance to pests and diseases, short maturation cycle and stress tolerance, for example.

The germplasm of Afghanistan's fruit, vegetable, and cereal crops is extremely genetically diverse and is under threat of erosion: if not collected and preserved *ex-situ*, it may be lost forever. Starting in spring 1999 and continuing until October 1999 a pilot project was funded by IPGRI to survey four zones of Afghanistan (North, North East, East Central and Eastern) and to collect germplasm of Almond, Pistachio and Walnut. A photographic study is being prepared to document genetic variability of Almonds, Pistachios and Walnuts. In places where Pistachio is not grown, Apricot variability has been included in the survey. The systematic collection, evaluation, cataloguing and preservation of cereals, legumes and vegetables and the preservation of grapes, pomegranates and pistachio requires additional funding.

International cooperation
The crop improvement programme has cooperated with Michigan State University (MSU), USA, with the international institutes ICARDA CIMMYT, IPGRI and the National Agriculture Research Centre of Pakistan (NARC).

National co-operation
The project maintains links with the remains of the Afghan Ministry of Agriculture: wherever an active department exists staff are invited to visit research plots. The programme is assisting the agriculture department of Qandahar, Herat, Kunduz, and Nangarhar by training staff and by providing small quantities of elite lines of different crops. Cooperation is extended to national and international NGOs (MCI, SCA, CHA, CoAR, VARA, DACAAR, MADERA, ISRA, Afghanaid, Solidarites Afghanistan) by providing sets of germplasm for testing and seed of new varieties for multiplication.

Training
Training and skill development is an important part of the programme. Below is a list of training courses conducted related to the crop improvement programme - participants included members of NGOs and FAO NPPPs:

- The Management of Research Trials: by FAO Crop Improvement. February 1997
- Wheat diseases: by Dr. E. E. Saari, CIMMYT senior plant pathologist. April 1997.
- Biodiversity and Genetic Resources - Collection and Conservation: by IPGRI staff from Rome and Syria. A training course funded and offered by IPGRI. October 1997.
- Collection of germplasm of nut and fruit trees: by Dr Rashid Anwar and Dr Shahid Masoud, PGRI, Pakistan. March 1999.

Opportunities for 2000 and beyond
The priority of the programme will remain the improvement of wheat, the staple crop, and the selection of new improved varieties of maize, legumes and oil seed crops.

Improved varieties will only have a substantial impact on national food security when used by the majority of farmers. The extension component of the programme needs to be strengthened to demonstrate to farmers throughout the country the advantages of this technology.

The seed production component of AFG/96/004 is intending to establish private seed enterprises throughout the country. To support this initiative, at least in the short term, the crop improvement component will continue to test and to provide new generation seed to meet the requirements of these new businesses.

The introduction and testing for suitability of new crop husbandry technologies under Afghan conditions, for example, minimum tillage for wheat-rice rotation, maize-legume mixed cropping, weed management and water use efficiency.

The conservation and collection of germplasm for the preservation of crop genetic bio-diversity will be vigorously supported if funds are donated for this purpose.

SEED PRODUCTION

Introduction

In the late 1980s seeds of self and open pollinated varieties of wheat, maize, rice, barley and pulses were procured from neighbouring countries at high cost (USD600-1,200 per MT) and distributed through NGOs as part of donor sponsored emergency relief programmes. With the end of the emergency phase there was renewed interest in support for food security and rehabilitation and development of the agricultural sector. The production and distribution of seed inside the country on a commercial scale is fundamental to and an essential part of this new phase.

Since 1995, successive FAO Crops programmes have been involved in seed production producing breeder and foundation seed under direct supervision on rented land and on parastatal seed farms (ISE). In addition, NGOs were contracted as implementing partners to produce quality declared seed (QDS) through contracted farmers. The seed procured from these farmer producers was processed and sold back to communities. Under the terms of the contract NGOs were allowed to keep the proceeds of all seed sales in a separate bank account on the understanding that these funds would be used at some future time to establish private seed enterprises.

FAO seed production has developed a national programme targeting food security over the whole country and local production programmes which target specific interventions, for example food security in vulnerable regions; the sustained return of refugees and community production as part of the UNDP PEACE initiative. All these activities are described here.

I National Seed Production Programme

The objective of the national seed production programme is to improve food security on a macro level so benefiting all strata of society. Improved varieties will have an impact on food security when farmers perceive an advantage in their use and when seed is available in sufficient quantities to satisfy demand and replace the older varieties. To achieve food security the programme has four major implementation objectives:

- ♥ Execution at national level
- ♥ To support agricultural rehabilitation

- To produce improved seed inside the country
- To improve the productivity of agricultural land.

Seed is produced for the five major crops: wheat and barley (the winter crops) and rice, maize and pulses (the summer crops). The pulse crops produced are black and green gram. The main production centres are the farms of the former parastatal ISE in Kabul; Qandahar; Herat and PuliKhumri, six NGOs based in the central and southerly regions of the country from Nangarhar to Nimroz and the Agricultural Department of Nangarhar (NADA).

Breeder, Foundation and Quality Declared Seed
Breeder seed forms the basis of all introductions of new seed varieties and the seed production programme. It is seed of the highest purity of the 'new' or 'improved' variety direct from the breeder. The new variety is selected in the breeding programme for traits of productivity, pest and disease resistance, fertilizer response, colour, straw length and other characters that make it highly desirable for farmers.

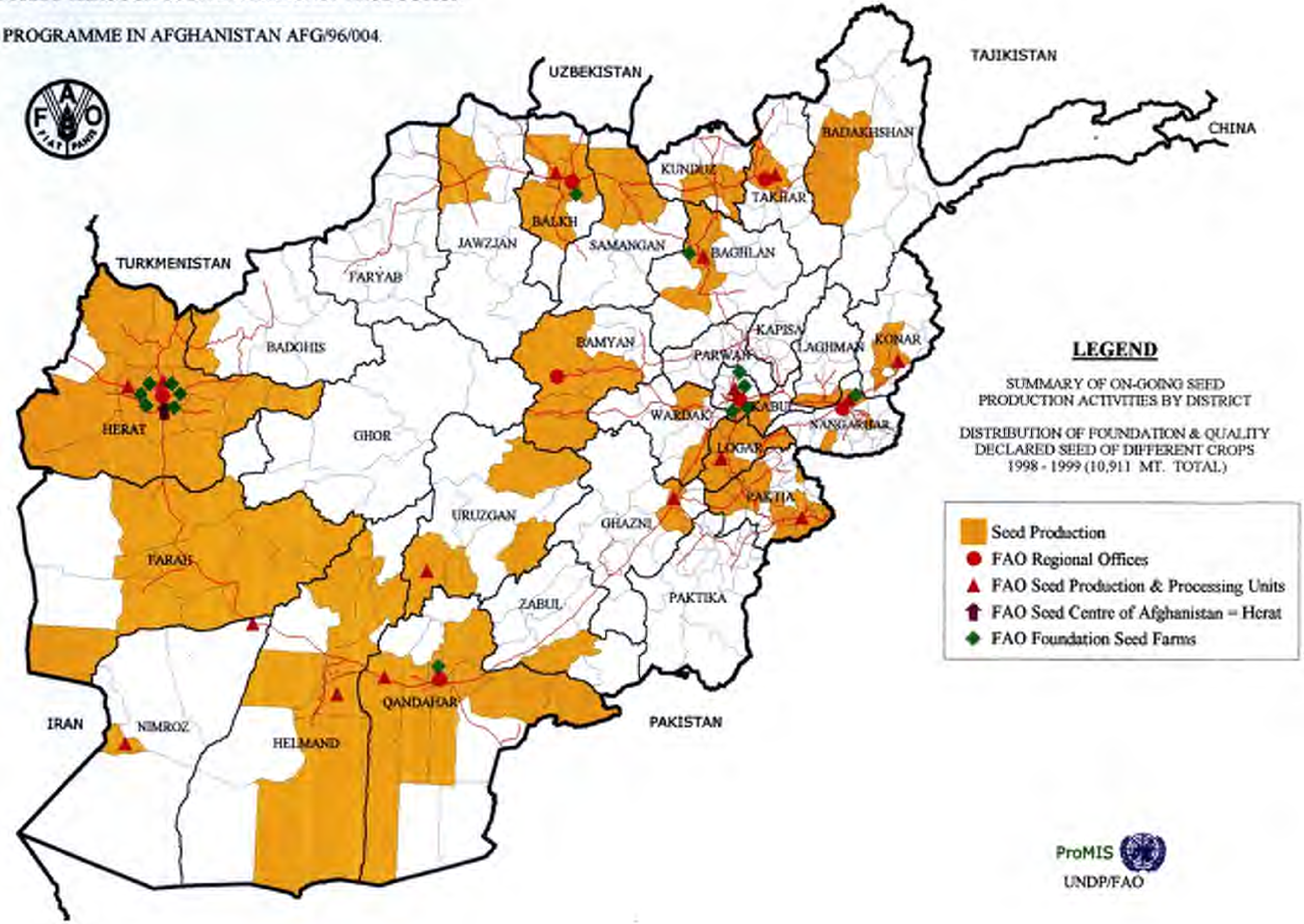
Foundation seed is high quality seed intermediate in the process of producing large quantities of commercial seed, available for sale to farmers, from breeder seed. Production of foundation seed from breeder's seed determines the ultimate volume of commercial seed that can be produced and be made available to farmers.

Quality declared seed (QDS) is commercial seed of the improved variety of a 'declared' quality produced by the FAO programme for sale to farmers. It is produced by multiplication of foundation seed. In most countries a central authority certifies seed to be of a specific quality but this is not possible in Afghanistan at present. The FAO programme produces QDS for sale to farmers in place of the certified seed. The priority crop is wheat since it is the staple crop and occupies 69% of irrigated arable land. It is not possible to produce 20% of the annual seed requirement (the ideal minimum output) so the target production is essentially to produce as much as possible given the resources available.

Harvest Year	Output	Crop (MT)					Total
		Wheat	Barley	Rice	Maize	Pulses	
1999	Foundation Seed	450	2	37	5	10	504
	QDS	3,060	30	255	736	271	4,352
	Farmer-to-farmer	3,000	50	500	1,200	450	5,200
	Total Seed	6,010	82	792	1,941	731	10,056
	No. of Seed Producers	3,517	26	415	1,120	465	5,543
1998	Foundation Seed	487	5	8	8	13	521
	QDS	2,668	35	290	612	322	3,927
	Farmer-to-farmer	3,195	70	675	1,215	475	5,630
	Total Seed	6,350	110	973	1,835	810	10,078
	No. of Seed Producers	2,560	72	436	1,025	480	4,573
1997	Foundation Seed	354	1	13	35	14	417
	QDS	2,700	120	350	465	300	3,935
	Farmer-to-farmer	3,500	50	725	1,045	500	5,820
	Total Seed	6,554	171	1,088	1,545	814	10,172
	No. of Seed Producers	3,125	35	228	385	233	4,006

FOOD SECURITY THROUGH SUSTAINABLE CROP PRODUCTION

PROGRAMME IN AFGHANISTAN AFG/96/004.



The table above shows quantities of foundation and QDS procured and estimates of quantities of these seeds distributed 'horizontally' (outside the procurement programme) by farmer-to-farmer exchange. The table shows that the seed production programme has reached its full capacity (about 5,000MT of QDS per year plus a further 5,000MT of nondescript seed distributed farmer-to-farmer) using its present implementation strategy and level of funding.

Farmer-to-Farmer Seed Exchange

It is part of Afghan culture that any one with seed of improved varieties is obliged to share the seed produced at the first harvest with his extended family. Such acts of co-operation reinforce family ties with distant blood relatives. More than 95% of farmers are believed to draw seed from their own stock or use seed given by, or exchanged with, relatives. It is estimated that seed producers annually exchange more than 5,000 tons, about 50% of their production, with their neighbours and relatives (see table). This farmer-to-farmer exchange is a powerful force in the distribution of new improved varieties.

Contract Seed Growers

The success of the programme depends on the selection of farmers contracted to produce seed. More than 4,500 growers are contracted each year. The best producers are those with integrity, long experience of the crop and with sufficient high quality irrigated arable land to produce the quantity of seed required. However, contracted farmers come from various backgrounds with different abilities and skills and learn by experience to improve seed quality and quantity. With some crops land needs to be isolated from neighbouring farmers growing the same crop to prevent cross-pollination and to produce seed of the desired genetic purity.

The introduction of new technology to increase agricultural productivity

In addition to good quality seed the programme is also introducing new technology, for example, increased use of fertilizer and new cropping and husbandry systems for the new varieties, with the objective of increasing the productivity of agricultural land. The demand of farmers for seed and the associated agronomic package is helping to spread these technological changes.

Fertilizer (DAP and Urea) procured and dispatched to Afghanistan 1997-1998

Year	DAP (MT)	Urea (MT)	Total (MT)
1998	3,257.5	2,007.5	5,265
1997	650	950	1,600
Total	**3,907.5**	**2,957.5**	**6,865**

In 1978, the year before the start of the civil war, Afghanistan achieved self-sufficiency in food production supporting a population of 14 million. The population is now estimated at 21 millions. To achieve self-sufficiency on the same land agricultural productivity must increase by over 50%. However, large areas of irrigated land are still not used for food production because of land mines, destruction of irrigation systems and substitution of wheat by poppy: 91,000ha in 1999 according UNDCP, having increased from 63,000ha in 1998.

The use of high yielding improved varieties and fertilizer has significantly contributed to the increase in productivity of land under the major cereal crops since 1978 (see table below). The figures calculated are the average yields for the entire production area, irrigated and rainfed combined.

Yields of major cereal crops 1978; 1988 and 1998 (kg/ha)

	1978	1988	1998
Wheat	1,131	995	1,276
Rice	1,905	1,450	2,200
Maize	1,583	810	1,500

Source: 1978 - Ministry of Planning, Government of Afghanistan
1988 - UNIDATA and FAO
1998 - FAO/WFP-Crop and Food Supply Assessment Mission.

Monitoring and quality control

The maintenance of standards is vital to instill confidence in any quality declared seed of improved varieties that the farmer may buy. Monitoring is carried out throughout the production process.

- Quality at field stage

For the programme to be able to procure the agreed quantities of high quality seed contracted farmers are required to maintain production standards. Training courses covering a range of relevant agronomic topics are regularly arranged for the contracted farmers. Field inspections are conducted by project NPPPs and only seed from fields conforming to the minimum specified quality standards is procured. The main factor determining seed quality is the timeliness of carrying out field operations such as weeding, roguing, application of fertilizer, irrigation and pest and disease management.

- Quality at Processing stage

Harvested seed contains much undesirable material and is processed to improve its purity and quality prior to storage and subsequent sale to farmers. Seed processing involves drying, cleaning, grading, treatment with fungicide; packaging and labeling etc. Processing is mandatory for all IPs. This project has over 20, fixed or mobile, seed processing facilities at various locations.

- Seed Testing

Testing seed prior to distribution is the final step in the production process. Seed is tested for moisture content, purity and germination. Occasionally samples are sent to FSCA, Pakistan as a reference or to settle a dispute between a seed grower and an IP.

- Storage of Seed and Fertilizer

The arid climate of Afghanistan enables safe storage of seed at ambient temperatures in simple facilities. Under these conditions seed can be stored for up to one year without the risk of losing germination. 'Rubbhalls' manufactured in Norway have proved ideal for FAO's purpose.

The Herat seed centre

Using funds generated by the proceeds of the sale of seed produced by the ISE, a seed centre has been erected on the outskirts of Herat. The centre is equipped with modern machinery to facilitate all the processing activities with a throughput capacity of 2.5MT per hour. The centre has a storage capacity of 1,000MT and a seed testing laboratory capable of testing 15,000 seed samples every year. This centre offers the FAO programme a site for farmer training and acts as a focus for its seed production activities in the region.

Collaboration with WFP - Food for Seed

Insecurity caused by fear of food shortage or monetary inflation frequently causes farmers to refuse to part with seed against a single cash payment at an agreed preset price. To overcome this problem a food-for-seed initiative was launched in 1994 in which WFP food grain was exchanged at a favourable rate (10-25%) over the agreed quantity of improved seed. Food-



Plate 22
Rainfed Wheat
Faryab



Plate 23
Maize
Paktya



Plate 24
Rice
Paktya

Plate 1
Home Sweet Home
Farah





Plate 2
Faryab

Plate 3
Ghor



for-seed proved popular. In 1998-99, WFP allotted more than 8,544MT food wheat to procure more than 6,000MT seed of wheat, rice, maize and pulses. The accumulated value of this collaboration since it began is 25,002MT of food wheat worth (at USD310 per MT) USD7.8 million.

Collaboration with other UN agencies

There have been several long-term programmes in the seed sector involving co-operation with other UN agencies:

- ♥ since 1989 UNHCR and FAO have been collaborating to produce and distribute seed to returning refugees
- ♥ since 1997 FAO has been collaborating with OPS and UNDCP to produce improved seed in the communities of the Peace initiative districts as technical support to UNDCP's programme to eliminate the cultivation of poppy from Afghanistan.

Privatisation of the national seed production programme

Afghanistan has an area of irrigated wheat land of around 1,234,000ha (WFP/FAO food supply assessment mission, 1999). At a seed rate of 130kg per ha the annual seed requirement for this area is estimated at around 160,000MT. Normal practice, based on the assumption that for most improved varieties resistance to the five or six major wheat diseases will break down within five years, is to replace 20% of the national seed requirement each year. However, if the initial target is set at replacing the national seed requirement every seven years then the annual seed requirement for irrigated wheat in Afghanistan is around 25,000MT. The FAO seed production programme annually produces between 4-5,000MT of Quality Declared Seed (QDS) which is 16-20% of the target.

FAO is involved at all levels of the production process. It has assumed a central technical role in establishing a crop improvement and variety testing capability as well as producing foundation seed as the raw material for the production of seed of a tested and declared quality (QDS) for sale to farmers. Despite the success of this programme, the output of which is substantial, the quantity of QDS produced neither meets the national annual seed requirement nor satisfies farmer demand for improved seed.

Whilst the initial priority of the FAO programme was to produce seed targeting food security, cost recovery and long term sustainability have been on-going concerns. If seed of high yielding varieties of wheat, the staple crop, was commercially produced and widely available in the bazaars it would probably raise confidence in the commercial agricultural sector and aid the sustained return of refugees. However, free market commercial production is not the case at present: seed production is still heavily subsidised which prevents the natural development of viable commercial seed enterprises.

Seed is being sold too cheaply. When establishing its seed production capability, FAO contracted a number of implementing partners to contract farmers to produce the seed. Production was based on the supply of the necessary inputs of seed and fertilizer being sold to farmers at subsidised prices: seed at bazaar price plus 10%; fertilizer at cost minus 10%. Under the terms of the FAO contract with its implementing partners, WFP food grain is used to procure the seed produced by the contracted farmers in the food for seed programme in which WFP donates the food grain free of charge. Different crops have different rates, but wheat seed is usually procured from producer farmers by exchanging 1kg seed for 1.25kg WFP food grain.

This procured seed is cleaned, treated and sold back to farmers also at a subsidised price of around USD230 (the bazaar grain price, around USD180 per MT, plus 10-25%) whereas the actual cost of production is around USD300. The proceeds of the sale of seeds and fertilizer to farmers has resulted in a substantial accumulation of cash, currently worth USD2.07m in the bank accounts of the implementing partners (see table below). This revolving fund is managed by a committee comprising the various participating agencies and donors.

Fund Holders	Amount USD
NGOs (MCI; IRC; ISRA; SCA; VARA)	1,555,431.34
ISE (Herat; Mazar; PuliKhumri; Kabul; Qandahar)	421,449.69
Agricultural Department (Nangarhar)	73,234.76
Communities (Qandahar; Grishk; Argistan; Balabaluk; Maiwand)	21,893.29
TOTAL	**2,072,009.08**

The result of the FAO programme is that local expertise is now available to produce seed of a declared quality standard at various sites throughout Afghanistan. FAO's plan, using the money in the revolving fund, is to create a number of fully commercial seed production enterprises. In April 1999 a seed marketing consultant was fielded to investigate how this could be done. It is hoped to have the first pilot programme up and running by the summer of 2000. The commercial and management components of these new enterprises will need to be supported and monitored closely; continued technical support may also be necessary, but overall responsibility for production should be transferred to a commercial entity as quickly as possible.

II. Local seed production

A) Local seed production targeting food security - Hazarajat

Food security in Hazarajat has been gradually eroded by the civil war and since autumn 1997 become critical for the poorest groups. Crops are grown at altitudes of between 2,000m and 3,000m and the frost-free period is short, hence varieties must be early maturing and short season. The food security of the region is characterised by an annual wheat deficit, which is made up by imports from outside the region, paid for by the sale of livestock and cash crops, mainly potatoes.

FAO activities have targeted improving food security using locally produced seed of improved wheat varieties. Production was initially in the more easily accessible districts of Bamyan, Yakawlang and Panjao of Bamyan province with future expansion to more remote areas planned in a step-by-step manner when security and logistical support allowed.

In autumn 1997, 1.4MT of seed of two improved winter wheat varieties plus fertilizer was distributed on credit to 28 farmers nominated by 10 community groups representing 72 villages in Yakawlang district. The 1998 season was particularly bad for rust diseases all over Afghanistan, the resistance of many varieties having crashed. One of the introduced improved varieties, Pamir-94, proved to be resistant to rust and higher yielding than local varieties. Farmers were able to see these advantages in field demonstrations established throughout the district.

At harvest, in August 1998, despite considerable military activity in the region, a total of 15.8MT of Pamir-94 wheat seed was procured from farmers in Yakawlang, in exchange for WFP food wheat. The seed was cleaned by local methods and re-distributed, with an appropriate amount of fertilizer, on credit, to 322 farmers and sown in Autumn, 1998.



Plate 25
Traditional land
preparation
Bamyan



Plate 26
Sowing Wheat
Bamyan



Plate 27
Wheat
Ready for Harvest
Wardak



Plate 28
Traditional threshing
Ghazni

Plate 29
Winnowing
Bamyan





Plate 30
Mechanised threshing
Wardak

District	No of farmer seed producers	Inputs distributed 1997 (MT)		Wheat Proc'd (MT)	Inputs distributed 1998 (MT)		Wheat Proc'd (MT)	Value @ USD300 per MT
		Seed	Fertilizer (DAP+Urea)	1998 Actual	Seed	Fertilizer (DAP+Urea)	1999 Target	1999 Estimate
Bamyan	364	1.4	21.0	2.6	6.5	13.0	90	54,000
Yakawlang	516	1.4	40.0	15.8	10.0	15.0	250	90,000
Panjao	50	0	0	0	2.5	10.0	25	15,000
TOTAL	**930**	**2.8**	**61.0**	**18.4**	**19.0**	**38.0**	**365**	**159,000**

In spring, 1998 in Bamyan district the NGO Solidarites distributed about 1.4MT of three facultative short season spring wheat varieties to farmers for multiplication, but only one of these, HD-2285, proved to be resistant to rust. Such was the success of HD-2285 that farmers were reluctant to release the quantities of seed agreed under contract. The NGO was only able to procure 2.6MT of seed against the anticipated 10MT.

In October, 1998 under an emergency proposal, funded by UNOCHA, the FAO programme purchased and successfully transported by truck, from Jalalabad and Kabul to Bamyan and Yakawlang, 19MT of seed of facultative spring wheat varieties (HD-2285 and Bakhtawar-92) and 38MT fertilizer for spring planting and harvest in 1999. Of this quantity 2.5MT seed and 10MT fertilizer was taken from Yakawlang to Panjao district and distributed amongst farmers for spring sowing. However, in 1999 spring planted wheat was a total failure due to drought.

In September 1999, WFP transported 200MT of food grain and 150MT fertilizer to the region to enable procurement of the harvest and autumn planting of the 2000 crop. The 1999 harvest of winter wheat in Yakawlang resulted in 160MT being procured with the aid of 200MT of WFP food grain. A further 55MT of seed was redistributed farmer to farmer. The procured seed, cleaned by local methods in the absence of appropriate machinery, was redistributed to farmers in Yakawlang (118MT) and Panjao (17MT) districts for further multiplication in year 2000. In addition, in order to commence the production of the improved varieties in the more remote and food insecure districts, seed and appropriate amounts of fertilizer were transported to Daikundi (Uruzgan) (5MT); Sharistan (Uruzgan) (5MT); Lal (Ghor) (5MT) and Waras (Bamyan) (10MT) in time for planting. The potential yield of this crop in 2000 is 3,200MT of improved seed of which probably half will be procured and redistributed. The impact on food security in the region is illustrated by the intense demand for the seed. Farmers are aware of the high yields obtained with these varieties: claims by farmers of yields of 5MT per hectare are not uncommon. The impact of this improved seed technology on wheat production in the highland areas is the change from spring to autumn planted varieties, a strategy that avoids crop loss caused by spring droughts.

The result of this programme started in 1997 with 1.4MT of seed and carried out at times under extremely hazardous conditions is that a mixture of winter and facultative spring wheat has been introduced to the region (Bamyan, Ghor and Uruzgan provinces). A significant start to alleviating the problem of local food shortages has been made. The value of the 1999 procurement is around USD64,500 and the potential yield of seed in year 2000 over 3,200MT. The objective of the programme is now to continue what has been started, to introduce other new improved wheat varieties and to strengthen the extension component enabling farmers to get the full benefit of the technology introduced.

B) Local seed production targeting sustained refugee return - with UNHCR

The per capita Gross National Product of Pakistan is believed to be 3 or 4 times that of Afghanistan, however, most Afghan refugees wish to return home. Indeed, many families visit their farms during the spring and summer months, only to return to Pakistan for the winter. If returnees decide, or can be persuaded, to invest money and energy in their land they will not return to Pakistan. Investments such as improved seed; new orchards; rehabilitation of land and irrigation systems are long term and signify a determination to stay. FAO can assist the sustained return of refugees by delivering technical support to farmers given as training, demonstrations and technical messages delivered through an extension system.

Group repatriation of Afghan refugees is a UNHCR initiative supported by targeted donor funding. Since most Afghan refugees are families from rural communities their sustained return can only be maintained using technical agricultural assistance. Nevertheless, the first requirement to prevent the return to Pakistan is for the returnees to have food security.

Since 1997 FAO and UNHCR have jointly implemented two projects to support refugee return supplying seed of improved varieties through local production with the matching quantity of imported fertilizer. The first project promoted the sustained return of refugees in areas of 'potential' return, in all the districts of Kabul and Farah provinces and did not discriminate between residents and returnees

	1997-8	**1998-9**	**Totals**
Seed distributed (MT)	186.0	186.1	372.1
Fertilizer distributed (MT)	209.0	186.0	395.0
Families benefiting	17,856	1,677	19,533

The second project supported refugees under the group repatriation scheme to return to 12 districts of 10 provinces. Beneficiaries were identified by the regional offices of UNHCR. Seed was supplied on credit whilst fertilizer was sold at the normal subsidised price. Training of contracted farmers in grading and packaging and subsequent use of the improved seed was an integral part of the project. To date over 19,533 families have benefited from this programme (see table above).

In Azro district of Logar province and Tezin, a sub-district of Sarobi in Kabul province, the Government of Japan has targeted funds for an integrated programme of various NGO and UN agencies to support the group repatriation and sustained return of Afghan refugees. FAO is involved in a number of interventions in this programme: irrigation; horticulture, extension and seed production. Whilst the return of refugees cannot be sustained by only one intervention provision of the staple food source is an essential element. In Azro and Tezin inputs of seed and fertilizer were made. The table below shows the number of initial number of farmers involved in the seed production element of the programme and estimates of the production in 1998 and 1999. Whilst some of this seed will undoubtedly be used as grain much of it will be exchanged as seed from farmer to farmer: the whole community benefiting. The estimated total value of the yield is shown.

District	Initial number of farmers 1998	Inputs distributed 1998 (MT)		Wheat Seed yield (MT)	Inputs distributed 1999 (MT)		Wheat Seed yield (MT)	Value to the community (@ USD300 per MT)
		Seed	Fertilizer (DAP+Urea)	1998 Estimate	Seed	Fertilizer (DAP+Urea)	1999 Estimate	1999 Estimate
Azro	330	10.0	10.0	200	30.0	35.0	4,600	1,380,000
Tezin	307	10.0	10.0	200	30.1	40.0	4,600	1,380,000
TOTAL	**637**	**20.0**	**20.0**	**400**	**60.1**	**75.0**	**9,200**	**2,760,000**

Targeted funding combined with the group repatriation scheme offers donors what appears to be the best value for money regarding refugee support. FAO has the technical expertise and interventions necessary to help refugees make a sustained return to their farms.

C) Local Seed Production through Communities in PEACE Initiative districts

In Qandahar and Farah provinces the UNDP PEACE Initiative (PI) has been implemented in a total of ten districts. Below is an account of the use of seed production by these communities to increase agricultural productivity and to generate capital to fund community based projects.

Seed multiplication groups made up of experienced farmers have been established to produce seed of improved varieties available for distribution to other farmers. The initial target distribution of 10MT of seed and 25MT of fertilizer per district was considered too low in some districts and raised to 30-60MT of seed by the programme dependent on demand; the size and agricultural potential of the district and the capacity of FAO to process the output. The general modus operandi is as follows:

- in selected districts field officers (NPPPs & CLOs) discussed with communities the potential for seed multiplication. Farmer groups are formed in response to expressions of interest in receiving alternative varieties of seed for multiplication. The groups choose responsible members as seed producers.
- the initial input of foundation seed and appropriate quantity of fertilizer (DAP and Urea) are sold at subsidised prices to the participating experienced farmers. The price of seed is grain market price plus 10-25% and fertilizer at cost price less 10%. Farmers purchase quantities to satisfy their planting requirements.
- farmers are contracted to sell back for cash at a 10-25% premium over the grains price a fixed quantity (usually around 50%) of their production to the shura and this seed is then sold to other farmers by the shura under a scheme facilitated by OPS. After processing this seed is sold back to the community and the revenue raised put into a revolving fund. Shuras under the guidance of OPS manage these funds at community level.
- one of the functions of the revolving fund is to ensure a continued production and supply of quality seed once FAO/UNDP is no longer involved. For example, it is planned that shuras will be connected to the national network of Afghan seed producers (ISE) to ensure a future supply of foundation seed of new wheat varieties.
- at present each group of experienced farmers is provided a mixed package of 3 or 4 varieties of foundation seed. Implementation is based on a 'once only' initial input of seed and fertilizer with the intention that farmer groups will be able to produce sufficient improved seed to improve food security and sufficient income to improve purchasing power within the community.

- in reality, due to the demand, groups request FAO to provide injections of the same varieties of seed in subsequent seasons, new improved varieties are also requested.
- the revolving fund is also used to capitalise loans and other interventions requested by the community to which FAO and OPS provide technical support.

Seed Associations

In each district a Seed Association is established made up of shura members and PEACE partners. It meets prior to the winter and summer sowing seasons to discuss seed requirements and the management of local production.

Quantities of seed and fertilizer distributed and seed procured

The table below shows the initial number of farmers involved, the total amount of seed and fertilizer distributed and the value of the wheat procured in 1997-1999. In real terms wheat is worth about USD60 per MT net profit to the community/shuras, although this margin varies considerably.

Peace Initiative group	No of farmers	Inputs distributed 1997 & 1998 (MT)		Wheat Procured (MT)		Value to the Community USD (@ USD300 per MT)		
		Seed	Fertilizer (DAP+Urea)	1998 Actual	1999 Target	1998 Actual	1999 Estimate	Total Estimate
Farah								
Sub-total	*3,957*	*450.8*	*450.4*	*91.3*	*400.0*	*27,390*	*120,000*	*147,390*
Qandahar								
Sub-total	*1,427*	*161.3*	*162.4*	*10.0*	*230.0*	*3,000*	*69,000*	*72,000*
TOTAL	**5,384**	**612.1**	**612.8**	**101.3**	**630.0**	**30,390**	**189,000**	**219,390**

The initial quantity of seed supplied was 300% above the targets set in the project document and the procured output, despite two periods of UN evacuation at crucial periods for crop production, had a value of USD30,390 in 1998. In 1999 it is planned to procure 630MT worth about USD189,000.

Establishing local capacity to produce seed

Within the PI programme the production and distribution of seed is community based. Apart from the initial supply of inputs the involvement of AFG/96/004 is confined to the supply of technical advice and extension. Communities are aware of the potential of improved seed to establish community-based seed production centres enhancing local food security. Based on

The value of seed procurement paid or allotted from community revolving funds 1998/99.

Year	Amount Spent or Allotted to the Purchase of Seed from Qandahar and Farah Revolving Fund (USD)
1998	24,397
1999	(A) Salaam 6,230 (B) Provision 54,613
TOTAL	**85,240**

the demand for seed and success of the programme some community shuras have purchased the seed from the producers, at a fixed price, in advance of the 1999 harvest - a practice



Plate 31
Seed Centre
Herat



Plate 32
Rubbhalls
Qandahar



Plate 33
Mobile Seed
Processing Unit
Qandahar

known locally as Salaam (see table above). The advance price paid is usually lower than the price at harvesting time, which benefits the shura: the seed producers who get payment much before harvest also benefit.

Credit schemes for small farmers and the rural poor

The revolving fund established using proceeds from seed sales is linked to an OPS implemented credit scheme in which the shura acts as banker providing seed on credit: the loan being repayable in cash the following season. The cash repaid can then be used to fund further credit in subsequent years.

Poverty alleviation is one of the main goals of the PI programme. Seed production cannot alleviate poverty of the landless rural poor directly, but money generated from seed sales can be used for credit schemes to assist them. Loans are made to assist agricultural and non-agricultural activities. The community shura selects the beneficiaries based on a number of weighted factors: for example, lack of assets; food and cash, and is responsible for all decisions concerning the credit scheme under overall supervision of OPS. The table below shows broad details of use of the revolving fund to supply loans to support agricultural and non-agricultural activities.

Peace Initiative Group	Agricultural activity Value of Loan USD	Non-Agricultural Activity Value of Loan USD	Total Loan Value USD
Qandahar	10,615	31,640	42,255
Farah	131,661	Nil	131,661
TOTAL	**142,276**	**31,640**	**173,916**

In addition to the supply of credit to individuals the proceeds of the sale of seed and fertilizer are also given to community groups set up by OPS with the long-term goal of developing sustainable community organisations. The immediate objective is to develop community activities and skills including the honest and transparent accounting of funds. This initiative has led to an understanding of the potential of committees to use community resources to assist the most disadvantaged in a sustainable manner. Some committees have reinvested the money in Bait-ul-mals, (village revolving funds), which strengthened these traditional village institutions and simultaneously, through loans, provided income earning opportunities for the most needy.

Community tractor hire scheme

Three schemes have been established so far, managed by the shura assisted by FAO and OPS. The first hire scheme was a pilot project in Khak-i-Safid and has completed one year, two others in Shindand and Balabuluk districts are up and running, a fourth in Panjwai is planned.

	Khak-i-Safid	Shindand	Balabaluk
Starting Date	08-Nov-97	16-Jan-98	21-Jul-98
No of tractors	5	2	4
No of drivers	5	2	2
No of other staff	2	None	Accountant 1
No of farmers benefited	1,500	75	16
Total gross income USD	7,933.0	1,344.0	428.0
Total expenditure	5,459.0	731.0	408.0
Net income USD	2,474.0	613.0	20.0

FOREWORD

The primary aim of the UNDP PEACE Initiative was Poverty Eradication And Community Empowerment. The FAO/UNDP Project "Food Security Through Sustainable Crop Production" AFG/96/004 forms one of the five primary elements of the PEACE Initiative.

The Project fulfilled its anticipated role in the PEACE Initiative while maintaining its national coverage.

This Document shows that it is possible, under the somewhat difficult circumstances in Afghanistan, to make solid gains in crop production through a mode of programme operations aimed at sustainable agricultural development.

The considerable project achievements are listed in this document and, equally important, so are the ways and means that have been deployed to reach them.

The publishers hope that the huge efforts put into producing this document will be rewarded by convincing donors and UN policy makers alike, that sustainable agricultural development activities should have much higher priority on the assistance agenda for Afghanistan.

Good reading.

Hans C. Brink
Programme Manager AFG/96/004

Communities have shown considerable interest in these schemes, which allow tractors to be hired to perform farm operations. Farmers unable to hire tractors from the expensive private sector have benefited from the community hire scheme. In the long run it is hoped that hire charges in the private sector will be reduced thus helping all farmers in the area. A fund management scheme implemented by OPS allows part of the income earned from tractor hire to be made available to improve the quality of life within the community by assisting other sectors, for example education; health and other social services

Opportunities for 2000 and beyond

Commercialise seed production and marketing activities currently carried out by implementing partners.

Increase the impact of improved seed on food security by strengthening the extension component of the programme to make farmers familiar with its use and advantages.

Develop in-country capacity to provide, at an international standard, quality control and technical services to private commercial seed producers including production of breeders and foundation seed for commercial enterprises

Consolidate the ongoing activities with wheat seed and develop the seed production capacities of the other major food crops

Target seed production activities to new areas, for example, to support the sustained return of refugees ('group repatriation') and severe food deficit areas.

HORTICULTURE

Introduction

In the late 1970's, immediately prior to the start of the war, horticultural production used about 12% of permanently irrigated land and played a significant role in the Afghan economy. Despite the export of vegetables being embargoed at that time the export of other horticultural products: melons, fresh and dried fruits accounted for over 40%[1] of the country's total exports. With the start of the war in 1979, there was a rapid decline in horticultural production. Much of the population was displaced or left the country as refugees; marketing networks were disrupted; irrigation systems, orchards and nurseries were abandoned or destroyed and varietal purity and stocks of vegetable seeds were lost. Since the end of the war in 1989, there has been a gradual return of refugees and considerable efforts made by farmers and aid agencies to rehabilitate horticultural crops and develop the horticultural sector.

Survey of Afghan horticulture

Most pre-war surveys and studies of Afghanistan's horticulture were reviews of data collected from various governmental institutions. Soon after the establishment of the UNDP funded, FAO implemented 'integrated crop and food production programme AFG/94/002' in 1995 it was noted that the absence of clear indicators prevented measurement of the impact of the programme. In 1996 a baseline field survey was carried out to establish benchmarks to be used as planning tools; to assist prioritisation of interventions and to measure their impact. The survey targeted specific regions and districts to assist a sustainable rehabilitation and

[1]Report No 1324-AF Horticultural Subsector Survey - Afghanistan (Vol.I). Agricultural Credit and Agro-industries Division - WORLD BANK. 5th May 1977.

development of the horticultural sector in Afghanistan. The survey was conducted at field level in more than 7,000 villages throughout all provinces of Afghanistan, and was, therefore, the first of its type ever conducted in the country. The draft of the survey results was published in June 1999, and the main findings were:

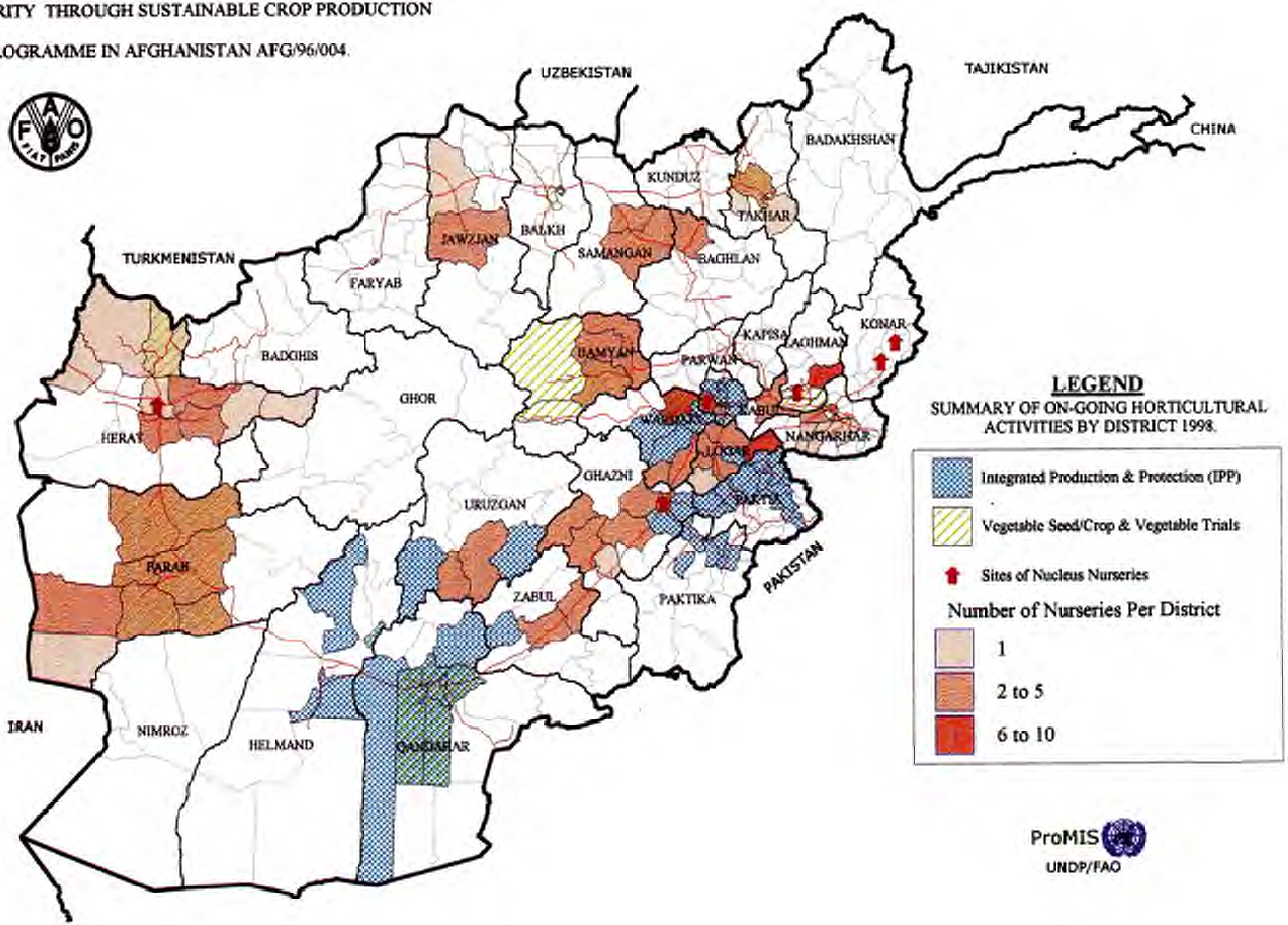
- horticultural crops are now cultivated on 10% of arable land and 16% of irrigated land
- the area under fruit orchards has increased by 18% since 1978, and more than 20% of orchards are less than 5 years old
- the area under vegetable crops has increased by more than 30% since 1978
- despite the increase in horticultural activity there remains little diversity with 96% of the area of orchards planted with only 5 different species (grape, almond, apricot, apple, and pomegranate) and 87% of the area of vegetables planted only with melon, watermelon, onion, potato, and tomato
- the gross income per unit area of cultivated land generated from horticultural crops ranges between 3 to 7 times that of wheat. However, opium poppy production remains the most profitable use of land (a minimum of 8 times that of wheat)
- most farmers (70%) receive technical information from neighboring progressive farmers, not from governmental or non-governmental extension workers
- 26% of farming families are landless (sharecroppers)
- 11% of rural families are headed by widows
- water shortage was identified by farmers as the major factor limiting the development of horticultural crops. 73% of villages suffer from a shortage of irrigation water due to the destruction or lack of maintenance of irrigation structures and the poor management of water resources at field level
- the lack of storage and processing facilities and the lack of market information limit the development of the horticultural sector
- there is a dramatic shortage of farm power for land preparation and crop operations with an average of only 57 pairs of oxen, 2.6 tractors, and 0.4 threshers per 1,000 hectares. These figures represent shortfalls of 143 pairs of oxen and 14 tractors (Swedish Committee Agricultural Survey of Farm Power, April, 1989). Regarding threshers, if we assume, using arbitrary figures, that improved wheat varieties are harvested with yields of say 4MT per ha, a thresher works at 1MT per hour, but works for only 6h per day and the harvest window is 21days to harvest 1,000ha. Then, the shortfall in thresher requirement is 31.3 machines per 1,000 hectares.

The results of the survey show that despite very severe constraints there has been a spontaneous interest of farmers to rehabilitate and develop the horticultural sector. In regions that have had access to donor assistance there has been a rapid development of the sector (beyond the rehabilitation phase) over the last five years. The main challenges now are to ensure assistance is available in the less fortunate regions, to make training and technical support available to farmers and to re-establish marketing channels thus enhancing horticultural rehabilitation and development over the whole country.

The interest in producing high value horticultural crops is correlated with the increase in the number of farming families with smaller land holdings and their need for purchasing power (cash) to buy food and other commodities necessary to maintain their quality of life. Population growth, beyond that which the agricultural land can sustain, implies that national

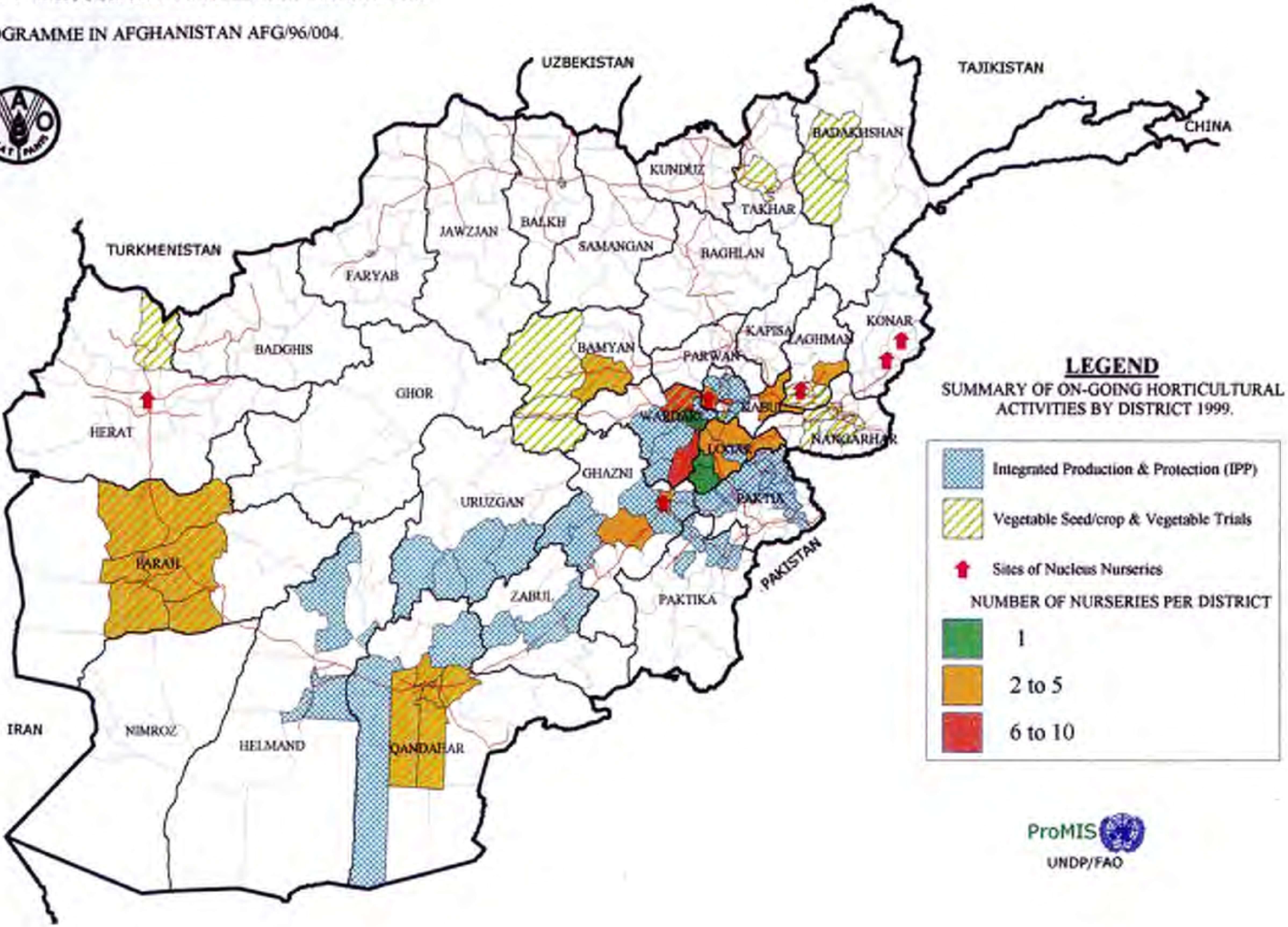
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food security will increasingly depend on the purchase of food grains on the world market to compensate for the deficit in production at home and on the sale of cash crops to pay for these purchases. The lack of infrastructure and the war footing of the economy, with high inflation, also create similar demands for cash. Unfortunately, this dash for cash is one of the major reasons why farmers are increasingly engaged in opium poppy production for which the promotion of horticultural crops is seen as an alternative.

Preservation of the national germplasm - nucleus fruit tree nurseries

Before the war Afghanistan possessed a wide range of indigenous fruit species and varieties, which constituted a valuable genetic resource of international significance. In 1977 a regional FAO programme for the Near East, funded by SIDA, was initiated to survey, collect and preserve this resource, but was abandoned at the start of the war. The central Asia region is recognised as the centre of origin of several pome fruits: *Malus spp* (apple), *Pyrus spp* (pear), *Cydonia spp* (quince), and stone fruit species: *Prunus spp* such as *Prunus amygdalus* (almond), *Prunus armeniaca* (apricot), *Prunus cerasifera* (cherry plum) and *Prunus persica* (peach). In addition, Afghanistan, in particular, is recognised as the centre of origin of *Juglans regia* (walnut), and *Pistacia vera* (pistachio). According to available records Afghanistan was also host to some 48 local, high quality cultivars of pomegranate *(Punica granatum)* before the war. Records also show that there were some 120 local cultivars of grape *(Vitis vinifera)* in 1979 when Afghanistan was one of the world's leading exporters of raisins.

During the years of conflict, many farmers fled their land, abandoning their orchards, which were often either destroyed or looted. As a consequence it is feared that much of this important genetic material may have been lost forever. Much of the wild pistachio forests of Afghanistan, once heralded for the quality and variety of their pistachio products, have already been destroyed and are under threat of total disappearance.

As part of an effort to preserve what remains of Afghanistan's genetic heritage each region of the country is being surveyed for fruit germplasm which is collected and conserved in a series of nucleus fruit tree nurseries. Six regional nucleus nurseries have been established on Government land to house:

- a collection of fruit germplasm (local and introduced) and to conserve Afghanistan's genetic resources
- a centre for the propagation of foundation plant material used to supply private nurseries
- a training centre for nurserymen.

By the end of 1998, more than 120 local pome and stone fruit and 14 grape varieties of indigenous origin had been identified and conserved in these nucleus nurseries. In addition the nurseries are stocked with 35 introduced pome and stone fruit varieties. To support this work IPGRI donated US$10,000 in 1999. Support is being sought to further develop this collection.

Establishment of private fruit tree nurseries

In order to promote the production of planting material for the establishment of new orchards, FAO has assisted and trained more than 200 farmers in 20 provinces throughout the country to set up and manage small commercial private fruit tree nurseries of about one acre each. Within the framework of the PEACE Initiative programme, 27 similar private nurseries have been established in Farah (6), Qandahar (6), Azro district of Logar province (6), Tezin sub-district of Kabul province (4), and Bamyan (5).

Each nursery costs a total of about USD2,000 to set up and support over an initial two year period and if well managed, has the potential to produce about 10,000 quality budded fruit trees per year after the second year. Such an output generates a gross income equal to USD2,000 to USD3,000 per nursery per year, making this activity commercially viable after the initial start up period. The potential annual output of quality budded trees from each nursery is sufficient to plant about 30 hectares of fruit orchards and vineyards every year and the combined annual output of the nursery programme equivalent to planting a total of 6,000 hectares.

Through the promotion of planting new orchards, the FAO programme is having a considerable economic and social impact in rural areas.

- The average price of quality budded trees on the open market has been considerably reduced - from about USD0.5 to USD0.25 per tree. As a result, poor farmers are now able to afford quality budded trees to establish new orchards.
- Since domestic demand for trees is now more or less satisfied by domestic production the risk of introduction of exotic pests and diseases on imported trees has been considerably reduced.
- The programme has created jobs and has the potential to create more. To manage one hectare of apple orchard requires some 600 to 800 man-hours per year. The output of the nursery programme has the potential to create about 3,000 full-time jobs each year. Additional jobs will be created in post-harvest activities such as storage and fruit processing, where women play an active role, and in marketing and distribution.
- The programme has improved farmers' incomes. The current yield of the average Afghan apple orchard is about 10MT per hectare whilst with improved management practices (as demonstrated by the FAO programme) the potential yield is about 30MT. Under the present depressed marketing conditions the farm gate price of apples is between USD0.13-0.15 per kg and the gross income of the current yield about USD1,500 per hectare (potentially USD4,500). This compares favourably with the current per capita GNP estimated at around USD130 (estimated to be in the range USD110-150).
- Starting in 2005, when the first new orchards planted from the output of the nursery programme come into production and realise their full yield potential, the annual income from this intervention, at current prices, is estimated at USD27 million.

Vegetables - variety observation trials

There is a high level of varietal mixture in farmers' vegetable seed stocks partly due to the import and distribution of considerable amounts of seed (including some hybrids) as part of emergency relief programmes. Most vegetable varieties grown in Afghanistan are old types and the selection is extremely limited, particularly with regard to suitability for the different agro-ecological zones of the country, for example, suitability for the high elevation areas where the growing season is short. Farmers propagate their own seeds which restricts the choice of varieties to only open-pollinated types and considerably limits the search for new varieties: the use of hybrids being inhibited by this practice.

In 1997 and 1998, 78 varieties of 23 different vegetable species where introduced and observed in the high elevation districts of Jalrez in Wardak province and Yakawlang, a PEACE Initiative district of Bamyan province. Observation trials were conducted at

Plate 34
Vegetables
Seed Production
Bamyan





Plate 35
Potatoes from microtubers
Kabul

Plate 36
Early Vegetables
Hot Beds
Bamyan





Plate 37
Vegetables
Seed Production
Onions
Nangarhar

Plate 38
Vegetables
Seed Production
Off-types, true types
Aubergine
Nangarhar





Plate 39
Nucleus Nursery
Jowzjan

community level and the opinion of local farmers and consumers sought to evaluate each variety. The trials created a lot of interest amongst farmers and farming communities, particularly with respect to the introduction of the new vegetable species. Broccoli, introduced to the high altitude region for the first time, was unanimously appreciated. It is a vegetable with good potential for development as a summer crop in the highland regions and as a winter crop in the warmer, low altitude areas.

In 1999, 36 varieties of 17 different vegetable species were selected for further testing and screening. It is anticipated that about 10 of these varieties will be used for seed multiplication and crop production in year 2000.

Foundation seed production - purification and propagation of vegetable seeds

There is no institution in Afghanistan capable of ensuring the selection and maintenance of pure vegetable varieties. Most farmers propagate their own seeds from old seed stocks. Farmers do not have the technical knowledge to produce pure seed or know how to prevent cross-pollination and the propagation of seed-borne diseases. As a result most farmers produce vegetable crops of poor yield potential, poor quality, and low market value.

The FAO programme identified varietal purification of existing varieties as a priority intervention. Given the current limitations on distribution and marketing of vegetable seed, it was decided to establish a regional capacity to produce and maintain its own stocks of pure foundation seeds. This activity was implemented in collaboration with the Crop Improvement component of the FAO Programme in four agro-ecological zones inside Afghanistan. In 1998, a total of 157kg of pure foundation seed of various vegetable species and varieties were produced in Nangarhar, Herat, Takhar, and Ghazni provinces and used to implement further vegetable seed production projects at community level in 1999.

Vegetable seed production

A) Eastern Afghanistan (Nangarhar and Laghman provinces)

Projects established under the AFG/94/002 programme, to develop community based vegetable seed and vegetable crop production, continued under the new programme with increased community participation. The main objective of this intervention was to enable communities to produce high quality vegetable seed in a sustainable manner. In 1998, these projects produced high quality seeds of onion (3MT), okra (3MT), green pea (3MT) and other vegetable seeds (500kg), sufficient to plant about 2,500ha and with the potential to support the livelihoods of about 5,000 farmers producing high value vegetable crops. In addition, 10DTs and 125CTs were trained in improved vegetable crop management practices, and a network of field demonstrations was established resulting in the training of about 2,500 farmers using a "Farmers Field School" (FFS) approach.

In 1999, a Provincial Vegetable Seed Centre (PVSC) was established in both Laghman and Nangarhar provinces and equipped with a seed cleaner. Each centre will provide technical support and advice to vegetable seed growers ensuring that vegetable seed is produced and processed to high quality standards and promote the marketing of this high quality vegetable seed at provincial level.

Project activities also focussed on the formation and organisation of vegetable seed growers associations at district level. In each province, 5 districts were selected to participate in the project and in each district local shuras were requested to select 5 villages where vegetable seed would be produced. Each of the selected villages was requested to nominate 5 key

farmers to participate in the project as community vegetable seed growers. The project thus involved a total of 25 vegetable seed growers per district (125 per province) who will form the core of a "District Vegetable Seed Growers Group".

In the next phase of the FAO crops programme (year 2000 and beyond) a logical next step is to organise these district level groups into "Provincial Vegetable Seed Growers Associations" and that these be made responsible to operate "Provincial Vegetable Seed Centres". These provincial centres will produce high quality vegetable seeds on an autonomous and sustainable commercial basis, marketing the seed throughout the province.

A rapid appraisal was made at district level to determine the demand for vegetable seeds and a production plan prepared accordingly. Each of the 5 selected villages in each district was made responsible for producing the seeds of 2 different vegetable species (or varieties) which cannot cross-pollinate. Thus each district produces the seed of 10 different species/varieties per district.

During all stages of project implementation all seeds produced remain the property of the vegetable seed growers. The function of the FAO project is to bring technical and logistical support to farmers, to co-ordinate the scheme and to ensure that all seeds produced and distributed meet the quality standards set. All vegetable seed growers participating in the scheme remain fully responsible to the communities nominating them, and respond to their needs.

B) In 1998, a similar programme was launched in the UNDP PEACE Initiative districts of Qandahar, Farah, and Bamyan provinces.
In this particular case, the programme was implemented under the direct responsibility of district and village shuras. From the outset project activities concentrated on training farmers in the basic technical principles of improved vegetable seed and crop production and to this end field demonstrations were established at farm level in a total of 11 districts.

Farmers from remote areas usually have limited access to high quality seeds and other agricultural inputs and farmers from the isolated districts of Farah and Bamyan provinces were particularly receptive to this programme. At the end of 1998, a total of 226 kg of various high quality vegetable seeds were produced in Bamyan and Farah provinces. In 1999, it is expected that more than 500kg will be produced.

Vegetable intercrops in demonstration orchards - farmer training
The area of land a family owns and the use of that land to produce food is critical to the quality of life the family enjoys. Intercrops of vegetables in Afghan fruit orchards are part of a farming system that maximises land use. As part of the "Integrated Production and Protection" (IPP) community based extension programme giving technical support to Afghan orchard farmers in south and south eastern regions a total of 139 vegetable crop demonstrations were established in 53 districts as intercrops in young fruit orchards in 1999.

The objective of this programme is to use demonstrations to train Community Trainers (CTs) and farmers in technical skills and management of horticultural crops within their own traditional integrated farming system. Each demonstration is used to give practical training to farmers and has contributed to the training of 2,000-3,000 vegetable growers in 1999.

Plate 4
Botanical Heritage
Ghor





Plate 5
Ghor

Plate 6
Ghor





Plate 40
Training
Nursery Management
Laghman



Plate 41
Nursery Management
Budding
Herat



Plate 42
Training
Orchard Layout
Ghazni



Plate 43
Grapes in flower
Saripul



Plate 44
Training
Preserving Fruit
with Sulphur
Apricots
Kabul



Plate 45
Potato Crop
Uruzgan

Women and vegetable production - kitchen gardens

In 1998, a pilot project, implemented in partnership with UNCHS(Habitat) and the NGOs Solidarités and IbnSina, was initiated in Bamyan City to promote kitchen gardens for women. Considering the difficulties, within the cultural context of Afghanistan, of access to women, it was planned that project implementation should only involve women.

The project established within the premises of basic health units (BHUs) and hospitals, model kitchen gardens in order to train women outpatients in vegetable production and kitchen garden management. In addition, the women also received training on nutritional issues concerning vegetables such as nutritional status, preparation of vegetable-based baby foods, cottage processing and preservation methods. Some proactive women having undergone the training sessions established additional model kitchen gardens in their villages.

By the end of the 1998 season, 3 training centres had been established within hospitals or BHUs, each having a model kitchen garden and a nutritional training unit. Each day these centres were visited by around 100 women, all of whom received awareness training. A total of 192 model kitchen gardens were established by selected women, all of whom received regular technical backstopping from a woman extensionist to ensure high technical standards in the management of their kitchen gardens. A further 70 women were trained in the basic principles for quality vegetable seed production, an additional component deemed necessary since all project activities were implemented based on the use of local inputs in order to ensure the long term sustainability of the programme.

The outputs achieved by this pilot project exceeded initial expectations. The integration of activities of partners from both health and agricultural sectors and the spontaneous interest of women and communities to participate largely contributed to this success. It is anticipated that that this type of integrated project has the potential to alleviate family and child malnutrition.

Potato crop rehabilitation for food security

Potato is grown in the low, medium and high agro-ecological zones of Afghanistan. In the chronic food deficit areas of the central highlands of Afghanistan, potato is important both as a foodstuff and as a cash crop used to purchase the extra wheat needed to make up the deficit.

With the technical assistance of a potato specialist consultant, a preliminary field assessment of potato production problems and constraints was made in 1998 and a plan of action prepared. In July 1999, FAO technical staff received a preliminary training course on potato research and production development from an international consultant and 15 potato varieties of early, medium, and late production cycles were introduced from China for further propagation and varietal testing at low, medium, and high elevations.

A project proposal for the sustainable rehabilitation of potato crop production in Afghanistan was prepared and funding was approved under the FAO Technical Cooperation Programme (TCP) for an amount of USD245,000. This project started in October 1999 with a duration of two years.

Horticultural training and capacity building

As part of the establishment of a community based extension system based on "Integrated Production and Protection" (IPP), a series of comprehensive theoretical and practical training courses was held for trainers. Topics covered included: fruit tree nursery management, pome and stone fruit orchard management, vineyard management, vegetable seed and crop



Plate 46
Packaging
Pomegranate
Qandahar



Plate 47
Packaging
Honey roadside sales
Nangarhar



Plate 48
Packaging
Apple wholesaler
Wardak

production, potato research and production development and apricot drying for export. A series of 19 extension leaflets and 12 booklets were prepared and published (each series was translated into both Dari and Pashtu languages) to support these training courses which benefited 1,138 trainees in 1997 and 1998.

Opportunities for 2000 and beyond

Horticultural crops have the potential to support food security and the rehabilitation of the Afghan rural economy. Farmers are showing an increased interest in cash crop production in preference to traditional subsistence crops. The opportunities are to support these changes:

- through innovative extension messages
- selection of species and varieties suitable for the different agro-ecological zones of the country. Afghanistan is able to produce dried fruits and nuts that are in demand on the world market
- credit schemes - the production of horticultural crops is land and labour intensive and is advantageous for small landowners with large families, poor farmers and sharecroppers: it requires a limited capital investment but has a high income generating potential
- water management - the availability of irrigation water limits the potential of horticultural crops, most of which are "water-efficient" ie high income generation per unit of irrigation water consumed
- development of intensive cropping systems - horticultural crops include short production cycle crops (vegetables) and perennial production cycle crops (fruit and nuts). An opportunity exists to increase the productivity and profitability of land by developing intensive sustainable farming systems based on the intercropping of fruit orchards with vegetable crops
- assisting the sustained return of refugees - fruit production is a perennial activity and investment in orchards a long term commitment. Fruit growers and their families if given technical support will make a successful and sustained return to their farms and villages in Afghanistan
- develop peri-urban horticultural production and marketing - this will create jobs for urban populations and contribute to the alleviation of poverty and malnutrition
- develop the potential of cottage industry processing of horticultural products - generating income for women and additional income for families
- develop domestic marketing and exporting - demand exists for horticultural products in domestic and in regional markets.

To further develop the horticultural sector a number of factors need to be considered:

- in regions where the horticultural sector is already well into the development phase future interventions may be more sustainable and successful if communities participate in their implementation
- the community-based extension system promoting "Integrated Production and Protection" (IPP) should include seed production and multiplication practices
- the rehabilitation of irrigation structures and the training of farmers in improved water management should be a top priority activity
- farmers are more likely to adopt new crops, increasing crop diversification, if there is adequate support for storage, processing, and marketing activities for a wide range of perishable horticultural products

- in the absence of a government framework future programme strategies should consider establishing community-based organisations (co-operatives, growers associations, etc) to support horticultural production and marketing activities
- high quality agricultural inputs are not accessible to most farmers. Future programmes should try to facilitate the development of an effective private sector (private traders, co-operatives, growers associations etc) by identifying and informing potential suppliers of the specifications and sources of the recommended inputs required in a given area and at a given time.

PLANT PROTECTION

Introduction

Pests and diseases can have a negative impact on crop yields and the storage life of crops and have the potential to destroy livelihoods. The costs paid by the farmer, in time and money, to control pests and diseases can have a positive impact on farm income and on his quality of life. The misuse and overuse of pesticides can seriously damage people, their livelihoods and the environment in which they live.

The plant protection component of the AFG/96/004 programme includes plague insect control and the control of pests and diseases of arable and horticultural crops. Implementation strategy falls in line with the general tenets of integrated pest management: minimise the use of pesticides; conserve natural enemies and cause minimum damage to the environment. The objectives of the programme are:

- to have a positive impact on farm income
- to avoid over-dependency on pesticides
- to design and implement interventions which target only pests and diseases causing serious economic damage to crops
- to design and introduce effective interventions that farmers can afford and are appropriate for the farming systems in Afghanistan.

Problems, perceptions and solutions to problems

Development of rust disease in wheat is favoured by moisture, but the spring rains creating ideal conditions for rust are also favourable conditions for wheat so the crop is able to compensate to some extent. In 1998, rust resistance in some wheat varieties broke down, resulting in numerous undoubtedly true, but alarmist reports of 30% crop loss in various parts of Afghanistan. Diseases of wheat such as the seed borne smuts and bunts, are annually causing up to 30% infestation, but in contrast there are few reports of crop loss.

Rust causes a real loss in yield, but the bread the farmer makes using grain from an affected crop tastes fine. On the other hand, smuts and bunts replace grain with a roughly equivalent mass of black fungal spores, so whilst there is apparently no loss in yield the bread the farmer makes from this grain is discoloured and unpalatable. The solution to rust disease is the introduction of new resistant varieties whilst the smut and bunt problem can be overcome each year by treating the seed with a fungicide, prior to planting.

There are two points to be made from this account: first, we live in a complicated world, rarely is anything as simple as it seems and secondly, the perception of a problem is important in deciding how to find the answer to it. When many years and several million dollars have been spent in developing a new wheat variety and its disease resistance vanishes overnight, having to start the search for resistant varieties all over again is of major concern.

However, when a chronic problem, of apparently similar consequence for the farmer, can be solved with a simple seed treatment, the perception of the problem is quite different. For the farmer, however, what matters is quantity and quality of the economic bit of his crop. In the case of both rusts and smuts, according to the above description, the farmer loses 30% of his yield and the quality of his life is equally undermined.

The Afghan farmer's perception of his problem should be the starting point for the FAO programme's search for appropriate answers. Much of the activity of the plant protection programme is trying to change people's attitudes and their perception of what is, and what is not, a problem. It is not as easy as looking in a book. Frequently problems or solutions to problems that are of low priority for the farmer are claimed to be of great importance by those with technical, commercial or political agendas. For example, any shopkeeper selling agrochemicals normally only supplies information to farmers which promotes the sale of the products on sale, necessary, or not.

The adoption of new interventions by farmers and the supply of recommended inputs

In order to introduce new interventions to farmers the FAO programme supplies inputs to establish demonstrations in farmers' fields. At the time of establishment of the demonstration and then subsequently throughout the year groups of farmers have access to training. If the demonstration is successful and farmers recognise the intervention as beneficial they will consider adopting the new technique and thus create a demand for the inputs required. Repetition of demonstrations year on year has proved important for information to spread amongst farmers and demand for inputs to grow.

The supply of inputs to the bazaars, by traders, in response to the creation of demand is necessary for sustainability. However, there are few genuine traders of agricultural inputs, the supply of which was undertaken by central government in the past. The lack of farmers' purchasing power and the resultant slow demand for agricultural inputs are factors influencing the reluctance of traders to supply inputs from the international market. Often if no trader responds groups of the better-off farmers get together to import the required inputs for local use. Although it takes time, given sufficient demand the necessary inputs start to arrive in the bazaars (the import, by traders, of sulphur dust from Turkmenistan to Herat and Qandahar for the control of powdery mildew of grapes illustrates the process).

Farmer training and extension

FAO provides farmers with plant protection information, training and demonstrations through various intermediaries. In the south, centre and east of the country where horticulture is most intensive FAO has developed since 1995 an extension system based on integrating the horticultural production and plant protection elements as described in this review in the section on extension. In the north, where horticulture is much less developed and where access to monitor interventions has not been possible since 1997, the plant protection programme is primarily concerned with plague insect control implemented through the PPQD (the plant protection component of the surviving provincial Ministries of Agriculture). In the UNDP Peace Initiative areas community agriculturalists (CLOs) act as district extensionists and implement all agricultural interventions through community trainers.

The total number of farmers who annually receive training directly is estimated, based on NPPP field reports, at between 2,000-3,000 per province. The numbers with indirect access to this information is considerably greater. Assuming that on average each village contains 100 families and each Community Trainer works directly with about 25 farmers and that these

farmers communicate with most of the other farmers in the community, around 200,000 farmers have either direct or indirect access to the information disseminated.

Estimation of the training impact of the Plant Protection programme - access to farmers
A) IPP extension programme 1999

Agency	Provinces	Districts	DTs	CTs	Farmers Direct	Farmers Indirect
NGO •	3	20	15	225	5,625	16,875
FAO	8	47	48	720	18,000	54,000

B) All activities	Number of farmers Direct training	Number of farmers Indirect access
Western Afghanistan		
Herat, Badghis, Farah	9,000	27,000
Northern Afghanistan		
Faryab, Sheberghan, Saripul, Balkh, Samangan, Baghlan, Kunduz	21,000	63,000
Southern Afghanistan		
Qandahar, Uruzgan, Zabul, Helmand Paktyka; Khost, Paktya, Ghazni	18,000	54,000
Central and Eastern Afghanistan		
Kabul, Logar, Wardak	5,625	16,875
Activities in other provinces		
Nangarhar, Laghman, Kunar, Kapisa, Parwan, Takhar, Badakshan, Bamyan	Interrupted 1998, discontinued 1999	
TOTAL	**53,625**	**160,875**

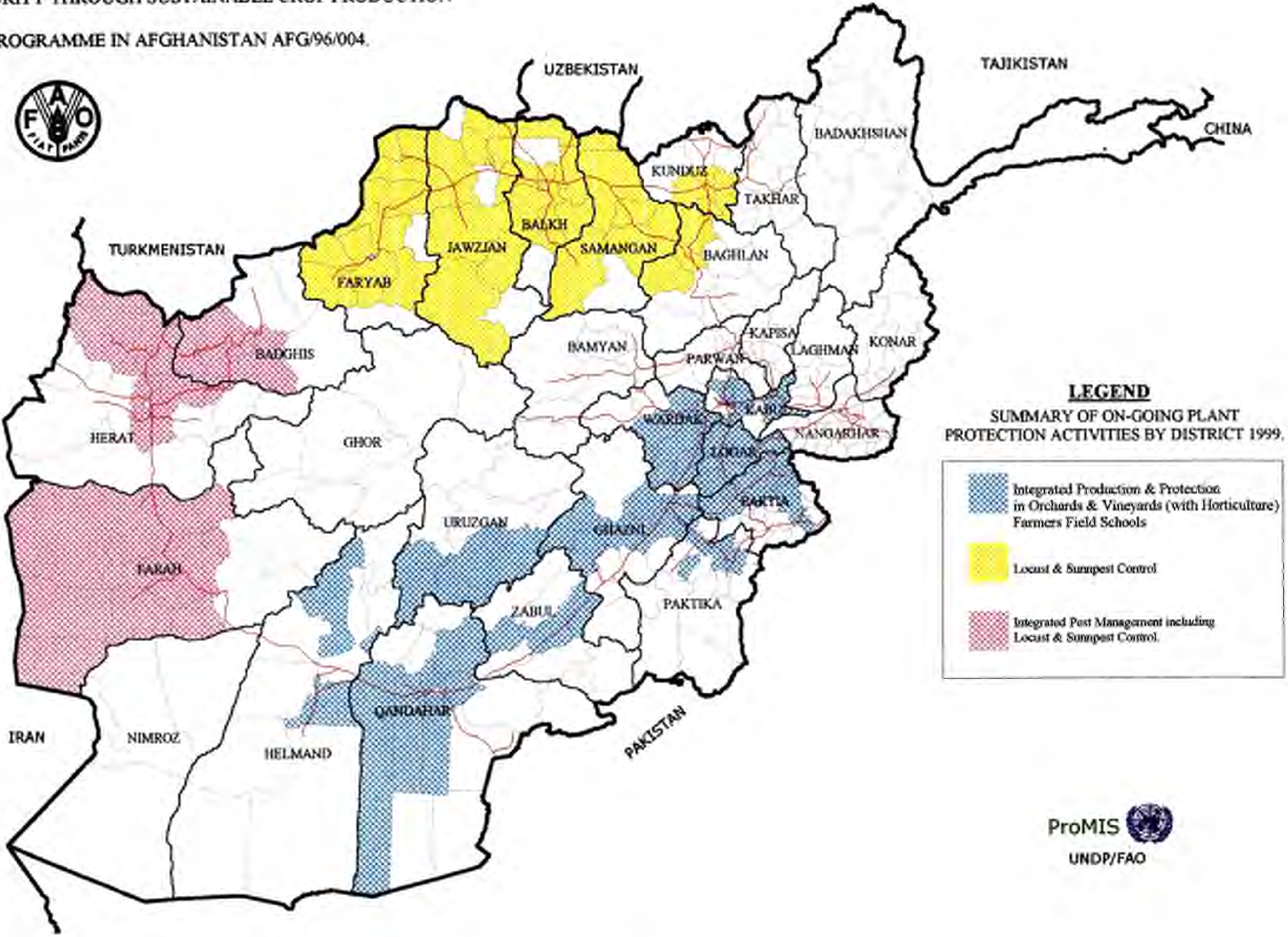
Plague insects
There are two groups of plague insects capable of causing considerable crop loss for farmers in northern Afghanistan - locusts, in particular Moroccan locust, and sunn pest, which in Afghanistan is a complex of four known species.

Plague insect control - Moroccan locust
The natural habitat of the Moroccan locust is found in the semi-desert areas of northern Afghanistan. In years of low precipitation, the desert vegetation dries earlier than usual forcing the locusts in their search for food to move out of the desert on to the nearest crop plants. It is in such years when the locust causes most damage to the livelihoods of wheat farmers. The locust has one generation per year, the insect surviving as eggs, in the ground, from the end of the summer to the following spring. In Balkh province eggs hatch and first instar nymphs emerge from the egg beds at the end of March or first week of April. The locust continues to be a potential problem for farmers until June/July, by which time the life cycle is complete.

Prior to 1989 the control of Moroccan locust was implemented by successive Afghan governments with prophylactic control programmes using BHC dust, a noxious and persistent

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insecticide imported from the former Soviet Union. Following the end of Soviet influence in Afghanistan locust control became part of the assistance programme implemented by NGOs and UN agencies, including FAO. In 1995 as part of a regular chemical control programme the FAO AFG/94/002 project used 2,200 litres of ULV formulated insecticide to control an outbreak of Moroccan locust in northern Afghanistan. At the end of that year, based on the assumptions that the insect spent much of its time in the ground and was predictable and vulnerable, it was decided to involve farming communities in the mechanical control of this insect. Mechanical control, which does not use insecticides, reduces the amount of general damage caused to the environment, including the numbers of poisoned livestock, and creates an opportunity to give the problem of locust control back to the farmer.

Communities were given training concerning the life history of the insect and the identification and monitoring of the development of egg beds. Communities were expected to take part in the digging of trenches in the desert in front of the advancing hopper bands soon after egg hatch. Mechanical control of the locust is completed when the community ushers the young hoppers into the trench and covers them with soil. Flying insects cannot be controlled by this method so it is important to control the young hoppers. In different parts of northern Afghanistan in 1999, some 25,000ha were controlled mechanically by over 4,000 trained farmers. However, late in the season swarms of Italian locusts *(Calliptamus italicus)* flew into northern Afghanistan from neighbouring Turkmenistan and Tajikistan. In Khulm district, Balkh province, farmers bought insecticides to control locusts covering an area of some 7200ha. It is believed that these insecticides were originally FAO property looted in September 1997 from WFP Mazar store.

Mechanical control is a simple idea that can be difficult to implement:

- ♣ the perception of many farmers is that only locusts actually threatening their crops are of real concern whilst in reality those within a certain radius of the crop are also a threat,
- ♣ despite being aware of the obvious benefits, communities do not always act in their own best interests,
- ♣ not all egg beds are located so late instars also have to be controlled,
- ♣ in border regions populations of Afghan locusts are augmented by swarms of adult locusts that fly in from neighbouring countries and these cannot be controlled mechanically.

The results of this control method have been as follows:

Year	Area controlled mechanically (ha)	Chemical control - insecticide used (litres)
1995	0	2,200
1996	2,753	0
1997	1,720	50
1998	2,019	200
1999	25,982	3,280 (estimated 3,200litres from bazaar)

Since its introduction in 1996 the programme has managed to control locusts and has saved the use of insecticides on an estimated 32,000ha of land. ULV insecticides are used at a rate of 1 litre per hectare and sold at about USD20 per litre. The total value of this saving is of the order of USD650,000.

FOOD SECURITY THROUGH SUSTAINABLE CROP PRODUCTION - AFG/96/004

This booklet is a record of the technical achievements of the FAO crops programme for the period May, 1997 to December, 1999 and a look at some of the opportunities for further development in the next phase 2000 and beyond. A glossary of the acronyms used in the text is inside the back cover. The achievements of the previous phase of FAO's programme (1995-1997) was published in April 1997 (AG:DP/AFG/94/002 Field Document 1).

INTRODUCTION

Of Afghanistan's population of 21 million people, some 85% are involved in agriculture.

The Past

Over the past 40 years various forms of international assistance have been involved in the development of the agriculture and natural resource sectors of Afghanistan. FAO has played a significant role. By 1978 Afghanistan was self-sufficient in food for its population of 14 million people. Soviet assistance during the occupation, 1979-89, brought into production, as state farms, large areas of government land. At the time UNDP-FAO had a regular 'country' programme based in Kabul, but security constraints confined activities to within the city boundary.

After the Soviets withdrew there followed a period (1989-1993) of cross border emergency relief. Delivery was highly dependent on national and international NGOs implementing programmes. The FAO programme concentrated on improving the technical base with better quality seed and availability of fertilizer. However, Afghanistan's civil war intensified, by 1992 there were some 6 million refugees and the international effort focussed on emergency relief and food aid. In 1993, when the crisis seemed to be under control, emergency efforts were shifted to getting agriculture working again.

In 1995 and 1996 there was still considerable support for emergency and humanitarian assistance, but interest in rehabilitation and sustainable development began to grow. In 1995 the FAO crop programmes were combined, into one integrated national agricultural programme 'AFG/94/002 - integrated food and crop production' with UNDP funding for two years. Crop improvement activities were added to this programme with separate SIDA funding. In 1997 UNDP launched its new country programme (the PEACE initiative - PI), a sustainable area development programme implemented by the integrated activity of UNDP funded programmes (FAO, OPS and CHS). The FAO crops programme, 'AFG/96/004 - food security through sustainable crop production', is regionally focussed on the PI areas (5 areas each of 5 or 6 contiguous districts) with national programme execution in 250 additional districts.

The FAO programme is fortunate in that its management unit has been together for nearly five years and constitutes an institutional and technical memory that no other UNDP funded programme, working in Afghanistan, can boast. It was with the implementation of the AFG/94/002 programme in March 1995 that the current team of four international Senior Technical Advisers (crop improvement, seed production, horticulture and plant protection) and Programme Manager (agronomy) came together. The programme also has an active interest in irrigation, apiculture, sericulture and agricultural extension. All these activities are reported here.

The implementation of the two programmes since 1995 has been a practical search to find interventions that work in the different Afghan farming systems. Failures can be as important

Plague insect control - sunn pest

Sunn pest is a group of plant bugs that feed on the grain of cereal crops, but is mainly considered a pest of wheat in a region roughly defined by Morocco and Spain in the west and by the Hindu Kush in the east. In Afghanistan there is a complex of four species each with its own distinct characteristics and distribution:

Eurygaster integriceps - was the subject of most of the classical research on the biology and pest status of the group carried out in Iran during the 1960s. Distribution: mainly Jowzjan.

Aelia acuminata - is able to feed on dry grain at the end of the season, possibly has two generations per year and is widely distributed throughout the north - Herat to Faryab.

Carpocoris fuscispinus - in Afghanistan its population is very low.

Dolycoris penicillatus - is the most abundant species by far in every province except Jowzjan: most referrals to 'sunn pest' are to this species. On leaving its hibernation sites (under low bushes on mountainsides at about 2,000m), it feeds on wheat in early spring (April) and returns to approximately the same sites to aestivate by early to mid-June.

Sunn pest is a problem for wheat farmers in the northern parts of Afghanistan - Farah to Badakshan, but mainly Herat to Jowzjan. Within this belt some 55% of the total irrigated and 85% of the total rainfed wheat is produced using some 1.35m hectares (1999 WFP/FAO food assessment survey report). It is neither feasible nor practical, and certainly not environmentally sound, to control sunn pest by spraying insecticides over the entire wheat growing area as part of a centrally managed prophylactic spray programme. Countries affected by sunn pest striving to produce wheat surpluses tend towards the use of such uneconomic control programmes, including aerial spraying, and only succeed in increasing the amount of insecticide applied each year. As a result, there is currently much interest in an international research effort to find non-chemical methods of control: the formulation of entomopathogenic fungi as mycoinsecticides and the augmentation of natural populations of egg parasitoids, for example.

Afghan farmers generally do not spray insecticides against sunn pest, most likely because they know that in most cases the cost of the insecticides used would be more than the value of the crop saved. In summer, insects moving back to high ground to aestivate tend to move in waves so a farmer may have to spray his crop more than once. Farmers know that the insects are in the process of moving to higher ground and have developed various techniques to disturb sunn pest and keep it moving away from their wheat fields: dragging ropes through the crop and smoke being the two most common methods. Fearing blame for food shortages the PPQD fulfills its historical legacy and encourages farmers to buy insecticides from its dwindling stocks originally supplied by Afghan governments and assistance programmes, including FAO. In 1999 the PPQD sold about 4600 litres of insecticide for sunn pest control throughout northern Afghanistan.

The objective of this FAO programme is to encourage farmers to own the problem and deal with it themselves. Through demonstrations farmers are shown mechanical control using cheap insect nets made from materials available in every home. Walking his crop with a net to effect mechanical control costs little in terms of external inputs and is as time consuming for the farmer as applying insecticide. In 1998, in Kushk district of Herat, more than 100ha of wheat was cleared of sunn pest by farmers using nets. Farmers know that sweeping their crops with nets is an effective way of removing sunn pest from their wheat crop. In 1999, across northern Afghanistan some 9000 farmers were given training in the mechanical control



Plate 49
Moroccan Locust
Mechanical Control
Balkh

Plate 50
Sunn pest
Mechanical control
Herat





Plate 51
Sunn pest
Entomophagous fungi
Saripul

of sunn pest. More than 100MT of sunn pest was collected from wheat in Herat and Badghis provinces, by farmers using home made nets.

Until biological methods of control become available the mechanical method remains the farmer's most efficient and cost effective method of sunn pest control. This FAO programme has collected various organisms with potential for use in non-chemical control programmes:

- ♣ two species of entomopathogenic fungi have been collected from overwintering sunn pest insects (*Beauveria bassiana* from *Dolycoris sp* in the mountains of Saripul and Faryab and *Verticillium sp* from *Eurygaster sp* in Sheberghan)
- ♣ Hymenopterous egg parasitoids *Trisolcus sp* (1997) were the first parasitoids of sunn pest to be collected in Afghanistan.
- ♣ In 1999 Dipteran nymphal parasitoids, awaiting identification, were collected also from Herat. This insect was recovered from 60.8% of a random sample of *Dolycoris sp* collected from overwintering sites in September, 1999.

The programme has monitored overwintering populations of sunn pest since 1996 with surveys carried out in early spring and late autumn of each year. The data collected now covers four years and is at the stage where trends can be identified. However, it is too early to say whether this data can be used as a reliable tool to forecast field populations of sunn pest.

Pest and disease management interventions

The biological control of woolly apple aphid *Eriosoma lanigerum* (Homoptera. Aphidae)

Woolly apple aphid (WAA) has been introduced to Afghanistan over the last fifteen to twenty years on seedling trees brought from Pakistan and is now common on apple trees in districts of Kabul, Parwan and Wardak Provinces in central and eastern Afghanistan. WAA is also known in isolated pockets in other provinces of the same general region, for example, Chamkani district in Paktya province. The aphid over winters as adults feeding on the roots of the tree and in early summer moves to the aerial parts where the population increases. It causes growth reduction, particularly in young trees, and is responsible for gall formation on branches and roots. The most sustainable method of control is the use of resistant rootstock varieties, now introduced to Afghanistan.

One of the natural enemies of WAA is a parasitoid, a tiny wasp, *Aphelinus mali* (Hymenoptera: Aphelinidae). In 1997, following a training course for NPPPs run by CABI, Pakistan on the culture, introduction and assessment of the WAA and its parasitoid, the wasp was introduced into Afghanistan. Three shipments from CABI of 600 parasitised aphid mummies were made between June and August 1997 and a fourth shipment in June 1998. These mummies were introduced into four infested apple orchards in Shaqardara and Qargha districts of Kabul province and on some apple trees in the UN compound in Kabul city. Farmers were given training on how the parasitoid controls the aphid and the orchards where the introductions were made used as demonstration sites for farmers and interested NGOs. By September, 1997 it was known that the parasitoid had become established in aphid populations at all release sites with a combined percentage parasitism of 46.7% and in the following spring it became clear that the parasitoid had survived the winter.

During 1998 and 1999 the FAO programme continued to redistribute parasitised mummies to orchards infested with WAA in the other affected provinces and districts, giving farmers training and encouraging farmer to farmer distribution of parasitised mummies collected from their own orchards. By the end of the 1999 season it was no longer possible to find orchards



Plate 52
Branches of apple tree infested with Woolly Aphid (WAA)
Kabul



Plate 53
Introduction of the WAA parasitoid *Aphelinus mali*
Kabul



Plate 54
Farmers' Friends
Aphelinus mali
(about 40x)

infested with WAA without populations of the parasitoid. In orchards with high populations of the parasitoid the aphid is under excellent control. During 2000 it is anticipated that the parasitoid will redistribute itself to bring the aphid under control in all districts of the affected provinces.

The cost of the initial training programme for NPPPs plus the initial four shipments of a total of around 2,400 insects was USD4,768. As a result, since 1997, a sustainable method of control for the WAA has been introduced that should increase orchard production and save farmers thousands of dollars in expenditure on pesticides. In addition, one of the major positive spin-offs from this programme has been the raising of the awareness of orchard farmers to the presence and usefulness of beneficial insects and the damage done by the misuse and overuse of insecticides.

Demonstrations of the control of Powdery Mildew of grapes
Grapes are an important crop throughout Afghanistan particularly around Kabul, Qandahar, Herat and parts of the north - Saripul and Samangan. Raisins were once a famous Afghan export. In recent times, the traditional drying rooms or 'raisin houses' - the 'kishmish khana' - that were once landmarks scattered throughout rural Afghanistan before the destruction of the last twenty years, are being rebuilt, indicating the revival of this industry.

The major disease problem of grapes in Afghanistan is powdery mildew which can deprive a farmer of his entire crop. However, powdery mildew of grapes can be easily prevented by the use of one simple lime sulphur wash in winter and three applications of sulphur dust to protect the fresh plant growth in spring. The use of sulphur is simply the difference between having a crop and not having a crop at all, demonstrations have been established in all the major grape growing areas. Farmers who have used sulphur for the first time frequently quote the staggering increase in production: 'from 80 wheel barrow loads last year to 900 this' said one Qandahar farmer who has a vineyard of 3.5 jeribs. A good healthy crop of grapes was worth about USD1,400 per jerib in Saripul Province in August, 1997. This has increased to USD2,250 in Herat based on market prices for fresh grapes in 1999 with raisins and fresh grapes of apparently similar value to the farmer. The cost of the 40kg of sulphur needed to protect one jerib is not more than USD10 and the return on this investment not less than USD1,650 per jerib for the Qandahar farmer. If, since 1995, supposing a very conservative estimate of 30,000 farmers, each with one jerib of land, have adopted this technique the value of the revenue over the period is approaching USD100million.

Demonstrations in vineyards of the control of powdery mildew using sulphur have been repeated throughout the different grape growing areas by this FAO programme since 1995. The repeated demonstrations simply build up the demand for the raw material (Sulphur dust) until some trader or group of like-minded farmers imports it from Turkmenistan. It is now not uncommon to see trucks loaded with sacks of sulphur dust on the road from the Turkmen border at Torghundi to Herat and Qandahar.

Demonstrations of the control of smut and bunt diseases of wheat
Flour made from grain contaminated with the seed borne diseases, the smuts and bunts, makes bread that is discoloured and unpalatable. However, these diseases can be controlled quite easily using a fungicide to treat the seed prior to planting. The fungicide of choice is Vitavax, a mixture of two active ingredients (carboxin and thiabendazole) giving the product systemic, curative and protectant properties. As with powdery mildew of grapes the use of the treatment is the difference between having a healthy crop or not. Demonstrations of the use of

a seed treatment have been on-going since 1996. All seed produced by the seed production programme is treated with protectant fungicides.

Smuts and bunts were responsible for losses of up to 30% in rainfed wheat in Badghis and Faryab in 1996. In Herat, in 1999, a farmer using local varieties of irrigated wheat obtained a yield of 1.625MT per ha from treated seed nearly 2.5 times the yield of clean grain he obtained from untreated seed. The cost of the vitavax required for 130kg of seed (sufficient to plant 1ha) is about USD5 at world market price (about 1/3 of this at Afghan bazaar prices) and the value to the Herat farmer of his increased yield about USD160.

In 1998 a trial was established, replicated in three northern provinces, to compare seed treated with Vitavax with two other seed treatment fungicides (Granosan and TMTD) available in the Afghan bazaars. The result showed that Vitavax was the most effective treatment currently available to Afghan farmers, giving over 97% protection.

Control of codling moth

The general problem in the orchards of Afghanistan is poor orchard management. In apple orchards, however, codling moth is a serious economic pest of apples and its control of concern to farmers. The moth lays its eggs on or close to the young apple near the time of fruit set. The first instar larvae, having hatched from the egg, probes, then eats its way into the small apple. Larval development takes place inside the growing fruit. Eventually, the final instar leaves the apple and crawls down the trunk of the tree to find a crack in the bark in which to settle and pupate. There can be two or three generations per year in Afghanistan.

Despite the fact that this insect destroys the marketability of apples, one of the positive aspects is that a large number of damaged fruit prematurely drop from the tree. In years of good pollination, when trees are loaded with small fruit, this premature 'fruit drop' enables the apples that remain to grow to a decent size and obtain a good price in the market place.

Because the window of opportunity is very narrow, control of the codling moth larva must be effected before it enters the apple. Chemical control is used, the timing of the application being based on petal fall. Due to the introduction of the parasitoid of woolly apple aphid more selective insecticides, insect growth regulators, for example, are being introduced to replace the broad spectrum insecticide initially used by the programme.

Mechanical control of codling moth is also possible. Pieces of corrugated cardboard or old sacking tied around the trunks of trees act as refuges for larvae looking for a place to pupate. Afghan farmers like this method of control and compete with each other to see who has collected the most larvae in their pieces of sack or cardboard. The method does reduce the population of moths in the next generation and is a very useful tool for trainers to explain to farmers other aspects of pest control, for example, the importance of timing of pesticide application, the biology of the codling moth and the identification of beneficial insects.

Control of Fruit Borer in pomegranate

A similar problem to codling moth is the fruit borer of pomegranate the young larvae of which enters the young fruit at the calyx end, through the remains of the flower. Samples of the moth were sent to NHM, London and identified as a species of *Gypsonoma* (Tortricidae: Olethreutinae). An ectoparasitic wasp from the larvae of this moth has also been identified.

Due to the general low level of management in pomegranate orchards field sanitation and mechanical control are the preferred interventions. Mosques and the local village crier (Jarchi) are used to broadcast messages to farmers to pick and destroy by burning, all infested fruit. In Samangan the borer was successfully controlled by putting a plug of mud on the flower (distal end of the young fruit) after fruit set, thus preventing entry of the larvae. Insect growth regulators have been tested and given encouraging results.

Control of melon fly (*Bactrocera cucurbitae* Diptera:Tephritidae) with insecticidal baits
Afghan melons have been famous for centuries. Marco Polo was reported to have commented very favourably about the melons of Sheberghan, but anything he said about the melon fly was not recorded, as far as we know. In an uncontrolled outbreak, all the melons in a field can be infested with the larvae of this fly, over 70 larvae have been recovered from one infested melon. Eggs are laid by the female flies within the surface of the fruit and after hatching, larvae enter the melon and feed on the flesh, later emerging to pupate in the ground. The only control measures available to farmers are persistent, broad spectrum systemic insecticides that contaminate the fruit with residues.

Female flies are unable to develop eggs in their ovaries until they feed on a protein rich diet. Since 1996 the programme has been developing a proteinaceous bait based on home made hydrolysed protein (meat stock) prepared by boiling up meat in water. In order to make the bait more attractive to the female flies home made lures are added by mixing in the smell of rotten protein (ammonia) prepared from fermented urine (or by adding urea) and the smell of melons (the smell of Cucurbitaceae) in the form of cucumber juice. In order to kill the flies an insecticide is added. Malathion, available in most Afghan bazaars, is ideal since it has a low vapour pressure (no smell) and has no systemic activity (will not be translocated into the fruit when applied to the leaves of the plant). Three litres of bait can be prepared from 1kg of meat. The advantage of using poisonous baits is that they control the fly without producing melons containing pesticide residues.

By the end of 1998 season the results of field trials showed that the poisoned baits were giving excellent control of the fly with less than 10% infected fruits in treated fields compared with 90% in untreated fields. In 1999 the bait was demonstrated to farmers for the first time in Herat and Farah provinces. Using a crude brush the bait is splashed on to the leaves of every fifth plant (every 10 metres in the row) at ten day intervals. The first application is made after the first flowering, but before fruit set. The use of baits is carried out in conjunction with field sanitation measures: unmarketable and infested fruit being removed from the fields and destroyed.

The cost of preparation of 3 litres of bait is essentially the cost of one kg of meat about USD1.5, rounded up to USD2.0 to include all other ingredients. This quantity is sufficient to make 25-30 applications to one jerib of land. Depending on location farmers made between 6 and 9 applications over the season. Production is about 4MT per jerib and melons are sold at about 16kg per dollar so the output is worth USD250 per jerib. The value of this control measure to the farmer (90% of the crop) is thus, about USD225 per jerib (USD1125 per ha).

Control of potato beetle *Leptinotarsa decemlineata* (Coleoptera: Chrysomelidae)
There are no previous records of Colorado potato beetle from Afghanistan (CABI Abstracts). In early June 1997 there was a field report of a brightly coloured beetle feeding on potatoes in northern Afghanistan, but no insects were received for identification. However, insects were positively identified on potatoes in the same area in early June 1998 and again in 1999.



Plate 55
Farmer's Friends
Sunn pest egg
containing parasitoid
(about 40x)
Herat



Plate 56
Farmer's Friends
Sunn pest
egg parasitoid
(about 40x)
Herat



Plate 57
Farmer's Friends
Sunn pest
nymphal parasitoid
ex *Dolycoris sp*
(about 7x)
Badghis

Extension material based on photographs produced in Islamabad was sent to other potato producing areas, however, the beetle has only been found at the one location. A campaign was established in 1998 to try to eradicate the beetle: some 24ha were sprayed in 1998 and the about same area in 1999. All infested potato fields and all potato fields within one kilometre of an infested field were sprayed with ULV chemicals. Monitoring for the presence of freshly hatched beetles in treated fields was carried out at 10-15 day intervals. The beetle overwinters as adults in the ground. Potato farmers with infested fields have been advised not to plant potatoes or other Solanaceous crops for at least one year. The campaign to eradicate the beetle is continuing.

Opportunities for 2000 and beyond

The number of plant protection interventions should continue to be developed in a step by step manner, according to the needs of farmers and within the limitations of the programme.

Agrochemicals are not generally available in Afghanistan, as a result the farming system contains relatively few plant protection problems and is open to creative interventions in the field of integrated pest management (IPM).

The programme should continue to develop regional links where appropriate to share and obtain information. It currently represents Afghanistan's interests in the SW Asia desert locust commission. Opportunities exist in the fields of biological control and IPM.

Farmer credit and input supplies are difficult interventions for assistance agencies to implement, but are necessary for the long term sustainability of this programme.

APICULTURE

Introduction

Afghanistan is at the western limit of the natural distribution of the eastern honey bee *Apis cerana* which is found in a patchy distribution throughout the country: in parts of Nangahar; Laghman; Kunar and Paktya in the east and in parts of Uruzgan, Ghor and Farah provinces in the west. As a result beekeeping with this bee using hives inserted into the mud walls of houses has been practised in Afghanistan for centuries. However, profitable bee management with this species is not easy, but since it is an indigenous bee it is resistant to indigenous diseases and parasites to which colonies of introduced exotic bees are susceptible.

The western honey bee *Apis mellifera* whose eastern limit of natural distribution is western Iran was introduced into Kabul by the Afghan Ministry of Agriculture in 1961. It met with initial success and was popular amongst Afghan beekeepers mainly because of the high production of honey by the colonies and the profitability of the hives. The number of Afghan beekeepers and colonies of the exotic bee grew quickly. However, by 1979 a number of bee diseases and parasites to which the local bee is immune, started to drastically reduce the numbers of colonies and the profitability of *Apis mellifera* beekeeping.

Between 1982 and 1984, a TCP provided the services of an FAO apiculture consultant to investigate the problems of beekeeping with the introduced bee. In 1996 FAO again fielded the same consultant in answer to a request from the Ministry of Agriculture for advice on the identification and control of apparently new diseases affecting the exotic bee.



Plate 58
Afghan migratory beekeeper using *A mellifera*
Nangarhar



Plate 59
Traditional wall hives
A cerana beekeeping
Paktya



Plate 60
Training - making value added products from beeswax



Plate 7
Once upon a time
a fertile plain
Farah



Plate 8
Irrigated Agriculture
Uruzgan



Plate 9
Upland Agriculture
Ghazni

At about the same time as its introduction to Afghanistan *Apis mellifera* was introduced into Pakistan. Over a number of years a system of migratory beekeeping was developed to maximise profitability in which hives are moved by truck to catch the flowering periods and harvest the nectar flows in the different climatic and ecological zones of Pakistan. Beekeepers practising this migratory pattern manage large numbers of hives and reportedly earn up to USD10,000 per year from the sale of bee products – mainly honey. However, as a result of its continued dependency on the exotic bee the Pakistan industry has resorted to the prophylactic use of acaricides and antibiotics to combat the increasing list of pests and diseases affecting the bees. The use of these products is unsustainable particularly in a world where pesticide residues and antibiotics in foodstuffs is becoming of increasing public concern and subject to legislation.

Most current Afghan beekeepers learnt their skills in refugee camps inside Pakistan and they too are oriented only towards honey production using the exotic bee. Some have also adopted migratory beekeeping, which for them follows a path that crosses the international border between Pakistan and Afghanistan. All are dependent on Pakistan for physical and technical inputs. In the middle-east region bee products of quality are highly valued and there is good earning potential from the export of products other than honey: wax; propolis; royal jelly; pollen and bee poison are examples. Added value bee products such as polishes; candles; ointments and potions can be made easily at household level and are also valued highly. Afghan beekeepers do not fully utilise the income generating potential of their colonies.

FAO involvement as technical advisers

Beekeeping can be an occupation or a hobby for women, the landless, the disadvantaged and the rural poor. The FAO programme is interested in playing a technical role to help Afghan beekeepers create a thriving, confident and self-sustaining apiculture industry capable of alleviating poverty and supporting the rehabilitation of horticulture. There are clearly a number of opportunities that could be developed with appropriate technical advice.

In May 1998 FAO fielded a consultant to investigate these opportunities. A training course for 26 private and NGO beekeepers was held in Jalalabad where beekeeping with the indigenous and the exotic bee was seen, an NGO programme in Badakshan was visited and the distribution of the indigenous bee in Hazarajat was investigated. The conclusions of the consultant's visit were:

- Community development programmes based on the exotic bee, honey production and migratory beekeeping are not sustainable.
- Afghan apiculture is currently characterised by a lack of technical standards, lack of technical skills regarding bee pathology and by falling earnings each year.
- The indigenous bee is under utilised, whilst it could be given the dominant role in a revitalised, sustainable industry based on local assets.

In July 1999 to follow up on the findings of the first mission 42 Afghan beekeepers, including 8 women were invited to attend a training course conducted by two international consultants, fielded by FAO and funded by DFID (UK). This course used facilities at the Honeybee Research Institute of NARC, in Islamabad where colonies of the native and exotic bee were available for use as training tools. Two expert apiculturists attached to the institute assisted the training. The course focussed on good beekeeping practice, the use of bees to generate income in community development programmes and the practical management of pests and diseases of bees. The conclusions and outputs of this consultancy were:

* The most sustainable future for apiculture in Afghanistan is to bring beekeeping with the indigenous bee *Apis cerana* to the fore. Apiculture based on this bee is very successful in other Asian countries such as Vietnam and China.
* A proposal for long term funding for FAO to give Afghan apiculture technical support and to develop an industry based on the indigenous bee was formulated.
* A manual for trainers, to be published as an FAO field document in Dari and English 'Generating income from beekeeping in Afghanistan - a guide for beekeepers, farmers and extension workers' has been produced.

Opportunities for 2000 and beyond

The long term objective is to create and support the development of an independent, self sufficient, healthy, profitable and diverse beekeeping industry.

When funds are available FAO plans to establish a technical apiary and a core of trainers able to give technical assistance to beekeepers of the exotic and the indigenous bee. Ultimately, there is scope for the technical apiary to become a self-sustaining enterprise.

This technical unit will have the capacity to advise NGOs in the establishment of sustainable beekeeping programmes such as those that target the rural poor, women and the landless as part of community development.

The unit will also be linked with FAO's farmer extension system based on integrated production and protection to have an impact on pollination and agricultural productivity.

SERICULTURE

Sericulture is a rural industry in which women play the key role and as such it can be an important source of income for some of the most disadvantaged groups of Afghans. In the provinces of northern Afghanistan associated with the Asian mulberry belt, sericulture (cocoon production, reeling and weaving) has been a traditional industry for over 2,000 years: in the mid-seventies the Afghan government attempted to develop the industry in fourteen provinces. Before the war most household compounds in this belt contained mulberry trees, the leaves of which are harvested to feed silkworms. Traditional silk products include turbans, chapans, scarves, ladies' veils (dopata) and carpets. Some 20,000 families in northern and western Afghanistan are involved in this activity. The annual national demand for raw silk has been estimated at 120MT (terminal report AFG/85/027, FAO 1995). Due to the erosion of institutions over the last twenty years, the country now lacks the essential tools for the rehabilitation of its indigenous sericulture industry. Silkworm eggs, cocoons and silk thread are imported from neighbouring countries: Iran, Turkmenistan and Uzbekistan. There remain several indigenous sericulture farms, but these require technical and financial assistance for rehabilitation.

For many years FAO has played an active role in supporting Afghan sericulture. In 1989 FAO, funded by UNDP for USD1.5 million and co-funded by the Kabul government, launched the project AFG/85/027 'Sericulture Development, Research and Training', based in Darulaman, Kabul, to expand and modernise sericulture activities. However, the project was suspended in 1992. In 1993 FAO distributed to returnees and residents in western Afghanistan a total of 5,000 boxes of eggs donated by China, Korea, Japan and Turkey. From 1994 to 1996, boxes of eggs were received as donations, or purchased, from China and Thailand. In 1995, FAO fielded a

consultant to investigate the establishment of local production facilities for the hybrid silkworm. Since 1997 FAO has given technical advice and OPS financed joint implementation of sericulture activities: 3,350 boxes were distributed in 1997 and 3,500 in 1998.

In 1999 6,620 boxes of polyhybrid bivoltine silkworm eggs were imported from China and distributed to 3000 women in Herat. Each box contains around 20,000 eggs and costs about USD3. To supply foliage of the necessary quality to feed the larvae produced from one box of eggs requires between 50 and 100 mulberry trees (OPS survey, 1998). Each box of eggs produced an average yield of 29.78kg (range 16kg to 42kg) of fresh cocoons and 4.8kg of raw silk. The yield of raw silk from this project is thus about 32MT and worth around USD380,000. The value of this project per recipient is about USD57 per box less the cost of mulberry leaves of about USD9. Based on these figures about 25,000 boxes of Chinese eggs are required to produce the annual demand for 120MT raw silk. The value of this silk is around USD1.4 million (about USD12 per kg) in farm gate sales.

There are good reasons why this sector should attract donor support for rehabilitation:

- Afghanistan has the tradition and an indigenous industry would replace the import of raw materials
- Sericulture activities can be integrated into regular household routines
- Where few other opportunities exist reeling cocoons offers paid employment for women
- Moriculture does not displace any other agricultural activity: mulberry can be grown on verges and waste ground.

Opportunities for 2000 and beyond

The role of sericulture in rural communities and the economics of the opportunities for the rehabilitation of sericulture and moriculture in Afghanistan need to be thoroughly examined.

EXTENSION

Introduction

Information may not be as overtly glamorous as some other forms of aid intervention, but in the right place and at the right time and knowing how to use it information is peerless. Information is king. Everybody has ideas and most people recognise a good one if it is applicable to them and presented in an appropriate manner. The FAO programme is a technical programme supporting food security, improving output and productivity by solving farmers' problems through information and training. Farmers usually receive this information through an extension system.

Developing a participatory extension system for Afghan farmers

In order to carry out its programme FAO needs to be able to listen to and share its ideas with farmers; to be able to give farmers training and to demonstrate different methods of solving problems, thus giving them choices. Farmers so enabled are indeed powerful. The objective of an extension system is to get information, ideas and training to farmers from a distance. An extension system capable of reaching and assisting rural communities must have permanent linkages, in the form of trainers, at different points along it so that information can pass in both directions: to and from the recipient. It is important for the recipients that the last link in the chain is always available. In terms of an extension system for farmers this means that the final link in the chain must be a trainer living in the community.

Since 1995 FAO has been developing an extension system for Afghan farmers based on an integrated crop production and plant protection programme in orchard crops. The development has now reached the point where the system can serve all crops grown in the farming system and where additional modules can be added in a step-by-step manner. For example, it is intended to add the production of staple crops to the system this autumn. In Afghanistan, the number of opportunities to modify the system of implementation is limited because there is only one growing season per year for most crops. In contrast, the technical messages, once formulated by STAs can be assembled as modules relatively easily, based on training and demonstrations and depending on the type of intervention or impact required.

FAO is using 47 districts in eight provinces based on Qandahar and Ghazni as a proving ground for the development of this extension system. In these districts FAO is implementing directly with farmers. Implementation is based on a system of volunteer community trainers (CTs) supported by district trainers (DTs) who are paid and mobile. FAO national programme professional staff (NPPPs) act as technical advisers, trainers and supervisors implementing the programme in specific groups of provinces. The STA's role is to formulate technical interventions and to manage, backstop and trouble shoot the implementation.

The following elements were found to be positive forces for successful implementation:

* the extension system should support the complete farming system, not part of it
* the extension system is only effective if the trainers implementing it are motivated. All district trainers must be given support by having regular contact with FAO NPPPs. Monthly meetings of DTs must include as many CTs and interested farmers as possible. Regular meetings with NPPPs facilitates back-up training; exchange of ideas; problem solving; increased commitment and peer motivation of trainers.
* District Trainers - must be local to and living in the district in which they work and must have received formal training in agriculture (university or agricultural high school) and must be mobile (equipped with a motorcycle) to ensure regular contact with CTs.
* Community Trainers – are volunteers so must be interested (for the right reasons); must be literate; should be innovative farmers and should be selected by their peers. Landlords and other so-called 'influential elders' must be avoided. CTs are the weakest link. Those who prove unsuitable must be removed, if the problem persists close the programme and move to another village.
* The distribution of CTs and demonstration sites throughout a district must not be clustered and should be based on common sense to maximise the impact of the programme.

The following elements describe how the extension system works to help farmers:

* Each CT is responsible with the assistance of the DT and Supervisor (NPPP) for the establishment and management of demonstrations used to transfer information and skills to groups of interested farmers through farmers' field schools (FFS).
* Demonstration orchards are essentially living workshops. Demonstrations are established to compare techniques; give farmers a choice, act as a focus and encourage debate. They may be as small as 1-10 trees. Demonstrations

Plate 61
Farmers' Discussion
New Orchard
Khost





Plate 62
Farmers' Discussion
Pruning
Ghazni

Plate 63
Farmers'
Discussion
Irrigation
Paktya



* involving complete orchards often miss the point and encourage negative factors to corrupt the system.
* Based on current experience the working ratio of demonstrations to villages is thought to be about 1 demonstration per 5 villages in large clusters and 1:1 in isolated villages, but dependent on the existence of a communal mosque for a number of villages (a meeting place where information is shared). Mosques and schools are meeting places frequently used by trainers to get their messages across.
* In return for acting as the pool of expertise in his community each CT receives training and very small amounts of inputs sufficient to establish small demonstrations on his land. For example, about 150 small demonstration orchards (2 or 3 per district) were established over the winter of 1998/99. The onus is for the CT to pay for his interest above the FAO contribution: a maximum of 10 trees per demonstration. Other demonstrations are established in older, established orchards.
* DTs are given sufficient agricultural inputs to allocate small amounts to each CT enabling them to establish demonstrations. Farmers deciding to adopt the recommended practices must purchase their own inputs from the bazaars.

Participatory extension systems are notoriously difficult to implement, indeed the successes are usually overstated and the shortcomings overlooked. In late summer 1999 provincial meetings were held for all CTs and regional meetings for DTs. Based on the motivation of the trainers and the interest of farmers in the information delivered we believe that the extension system described above is becoming increasingly useful to farmers. As modules of information are added to the system it has the potential to meet the needs of increasing numbers of farmers in different farming systems. The potential impact of the programme in orchards, through better orchard management alone, is a 200% increase in productivity.

Opportunities for 2000 and beyond

Integrate all elements of the crops programme into one extension system and implement it in all agriculturally significant districts of the country to target food security issues, for example the demonstration of improved varieties of wheat.

Most refugees will return to their land without any immediate means of technical support for agricultural activities. The development and implementation of this extension system offers one way of sustaining the livelihoods and the return of refugees.

Plate 64
Khas Uruzgan





Plate 65
Taywara
Ghor

Plate 66
Flight Operations
Another safe flight
Thank you



GLOSSARY

ACIR - Annual Cereal Import Requirement, an estimate of the annual food (cereal) deficit
BHC - Benzene HexaChloride, a persistent organo-chlorine insecticide "related" to DDT
BHU - Basic Health Unit, a health clinic
CABI - Commonwealth Agriculture Bureau International
CIMMYT - the International Maize and Wheat Improvement Centre, Mexico
CLO - Community Liaison Officer, between a UN agency and the community in the PI
CT - Community Trainer, a farmer acting as a trainer for other farmers in his community
DAP - Di-Ammonium Phosphate, a fertilizer (18-46-0)
DDT - DichloroDiphenylTrichloroethane - a persistent organo-chlorine insecticide
DFID - Department For International Development, Government of United Kingdom
DT - District Trainer, a mobile trainer, responsible for all the CTs in a district
FAO - Food and Agriculture Organisation of the United Nations
FFD - Farmers Field Demonstration, a demonstration of new technology in a farmer's field
FFS - Farmers Field School - a 'participatory' method of getting information to farmers
FOOD-FOR-SEED - contracted growers receive WFP food grain in exchange for seed
FSCA - Federal Seed Certification Agency, Pakistan
GNP - Gross National Product
ha - one hectare 10,000 square metres
ICARDA - the International Centre for Agricultural Research in Dry Areas, Aleppo, Syria
IP - Implementing Partner, contracted by UN agencies to implement sub-projects
IPGRI - International Plant Genetic Resource Institute, Rome, Italy
IPM - Integrated Pest Management - an environmentally friendly plant protection ideology
IPP - Integrated Production and Protection, a holistic approach IPM plus production.
ISE - Improved Seed Enterprise - parastatal attached to the Ministry of Agriculture, Kabul
jerib - Afghan measure of land area - one fifth of a hectare, 2000 square metres
NGO - Non-Government Organisation, used as "implementing partners"
NADA - Nangarhar Agricultural Development Association
NARC - National Agricultural Research Centre (of Pakistan)
NHM - Natural History Museum, London
NPPP - National Professional Project Personnel
PEACE – Poverty Eradication And Community Empowerment - UNDP's country programme
PI - UNDP PEACE Initiative programme
PPQD - Plant Protection and Quarantine Department of the ministry of agriculture
QDS - Quality Declared Seed - seed of a declared (but uncertified) quality and purity
SIDA - Swedish International Development Agency
STA - Senior Technical Adviser
TCP - Technical Co-operation Programe
TMTD - a formulation of Thiram from the Soviet Union, a protectant fungicide
MT - a metric ton, 1000kg or 2,205 pounds
ULV - Ultra Low Volume, at 1 litre/ha, pesticide application technology using small droplets
UN - United Nations
UNCHS(Habitat) - Centre for Human Settlements
UNDCP - Drug Control Programme
UNDP - Development Programme
UNHCR - High Commissioner for Refugees
UNIDATA - a United Nations project, an information gathering unit for Afghanistan
UNOCHA - Organisation for the Co-ordination of Humanitarian Assistance to Afghanistan
UNOPS - Office for Project Services
WFP - World Food Programme of the United Nations

Food and Agriculture Organisation of the United Nations

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as successes in this regard. From the beginning sustainable agricultural development was the agenda, interventions were designed to produce sustainable solutions to specific problems. The programme gives farmers technical information enabling them to make choices about how they solve a problem, it is not about giving farmers a free hand out.

The Present
So what has this team and these two programmes achieved?

The FAO crops programme has been at the forefront of changing the assistance agenda from one of emergency relief to sustainable development. It alone has been responsible for the paradigm shift amongst its own national staff and implementing partners concerning what we are trying to achieve and how we go about it. The result is an awareness and a determination that programme implementation should be sustainable and prevent the creation of aid dependence amongst farmers and rural communities.

Secondly, the programme has come up with a number of innovative interventions that have successfully targeted pertinent issues in Afghan rural communities and generated income for a cash poor rural economy:

- The selection of new 'improved' varieties of cereals and food legumes that out yield local varieties
- Production of these new 'improved' varieties as 'Quality Declared Seed' (QDS) for farmers at a number of different centres
- Increased the availability of cash crops - budded fruit trees and vegetable seeds - and improved their potential yields
- A number of cash saving solutions to plant protection problems.

The Future
So in what direction would we like to take this agricultural programme in the future?

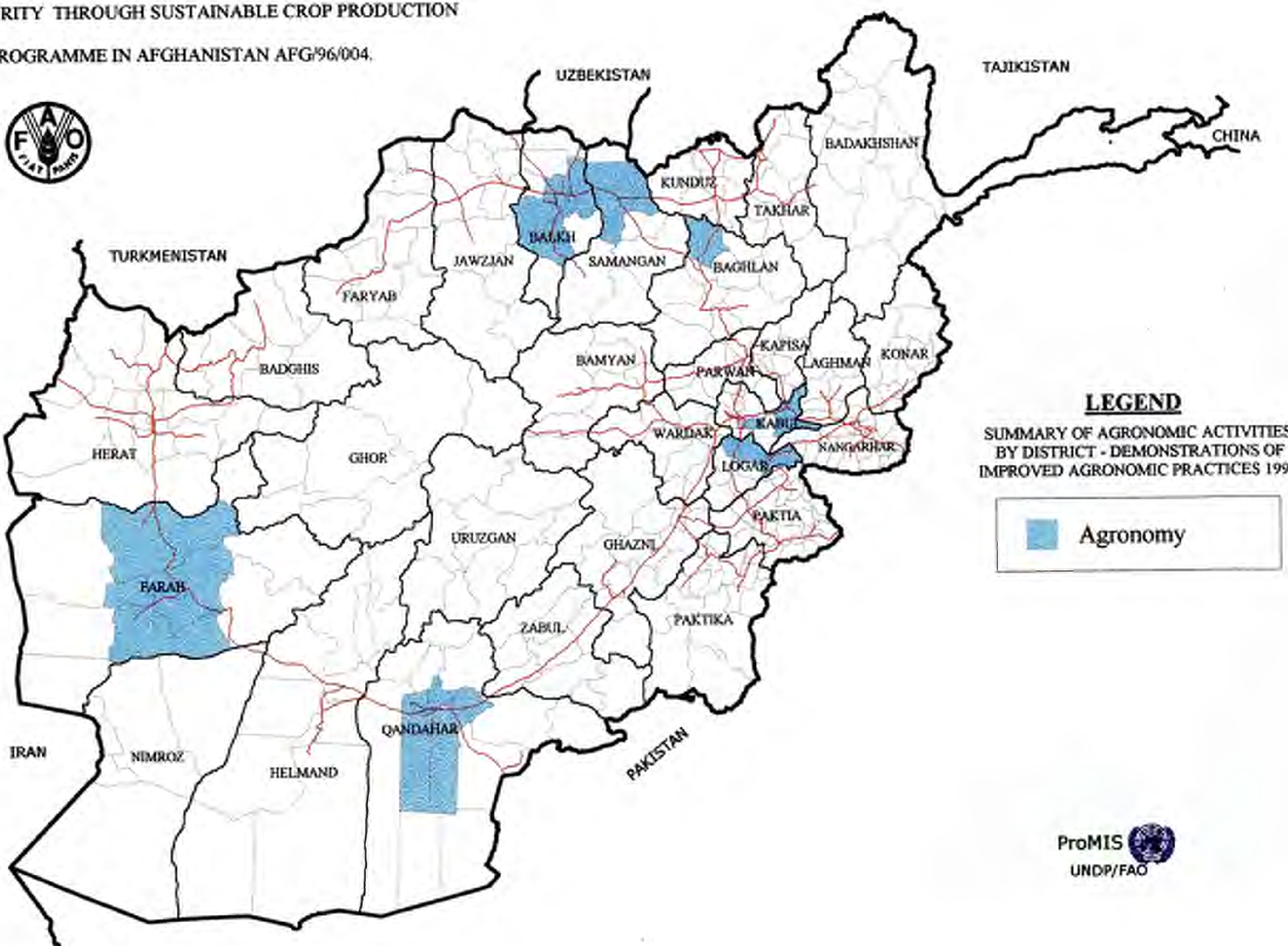
These excellent interventions have not as yet realised their full impact on food security or on the incomes of rural communities. There are good reasons for this. To have a major impact on food security and be able to sustain livelihoods the programme and its extension system have to be available to farmers in all the major wheat growing and in the main food insecure areas. To have an impact at a macro (national) level it is necessary to be present and to have a national programme. To have an impact at the micro (local) level, in remote food insecure regions, the programme has to be present and implemented locally.

Secondly, these interventions have the potential to encourage the return of refugees and help to sustain the livelihoods of returnees. Helping returnees sustain their livelihoods in Afghanistan with an integrated agricultural development programme is a more cost effective use of tax-payer's money than giving refugees food aid in a first country of asylum.

Lastly, the timing is about right and the programme about ready to influence the formation of a simplified institutional structure with the minimum number of bureaucratic posts. To have maximum impact and benefit for Afghan agriculture trained agricultural technicians should, wherever possible, be working at field level in their home districts, with farmers.

FOOD SECURITY THROUGH SUSTAINABLE CROP PRODUCTION

PROGRAMME IN AFGHANISTAN AFG/96/004.



AGRONOMY

Introduction

The population of Afghanistan in 1999 is estimated at 21 millions growing at an annual rate of 3.4% from the UN agreed figure for 1997 of 19.5m. The annual per capita intake of cereals is estimated at 160kg (1998 WFP/FAO food assessment mission report) although higher figures (180-200 kg per capita) are often quoted. In order to feed the nation Afghan farmers are using some 2.8m hectares of land planted with cereal crops of which about two thirds are irrigated. Wheat is the staple crop and occupies about 69% of the irrigated land and most of the rainfed.

The annual food deficit is the actual shortfall in the ability of national agricultural output to meet domestic needs. In Afghanistan the size of this deficit is influenced each year by a number of extraneous factors including: the export of local surpluses to neighbouring countries and the use of irrigated land to produce alternative crops (including illicit and licit cash crops). However, in recent years the most important factors have been the break down of disease resistance (yellow rust disease) in irrigated wheat varieties (1998) and drought (absence of rainfall and snowfall) in 1999. The annual cereal import requirement (ACIR) is an estimate of the food deficit produced by the WFP/FAO food assessment survey made each year inside Afghanistan. The table below gives estimates of the ACIR and figures from the annual UNDCP survey of poppy cultivation in Afghanistan where poppy is grown on the best, irrigated agricultural land and competes directly with wheat production. Improved wheat varieties grown on this land would yield around 4MT per ha.

Year	ACIR (MT) (Source: WFP/FAO)	Area of Poppy (ha) (Source: UNDCP)	Potential wheat yield substituted by poppy (MT)
1999	1.1m	90,983	363,932
1998	740,000	63,674	254,696
1997	711,000	58,417	233,668

The 1999 WFP/FAO food assessment survey estimated that there were 1,196,000ha of irrigated wheat and 831,000ha of rainfed. Over the three years 1997-1999, the average estimated yield per hectare of irrigated wheat is 1.65MT and that of rainfed 0.74MT. The table below shows the areas, yields and production of the main cereal crops for 1997-1999.

	Area ('000ha)			Yield (MT per ha)			Production ('000MT)		
Cereal	**1997**	**1998**	**1999**	**1997**	**1998**	**1999**	**1997**	**1998**	**1999**
Irrigated Wheat	1,224	1,234	1,196	1.7	1.6	1.66	2,080	2,020	1,988
Rainfed Wheat	900	952	831	0.7	0.9	0.62	631	814	512
Rice (Paddy)	180	180	140	2.2	2.5	2.0	400	450	280
Maize	200	200	160	1.5	1.6	1.5	300	330	240
Barley(for grain)	200	200	180	1.3	1.2	1.2	250	240	216
Total	**2,704**	**2,766**	**2,507**	**1.35**	**1.39**	**1.29**	**3,661**	**3,854**	**3,236**

Source: WFP/FAO Crop and Food Supply Assessment reports

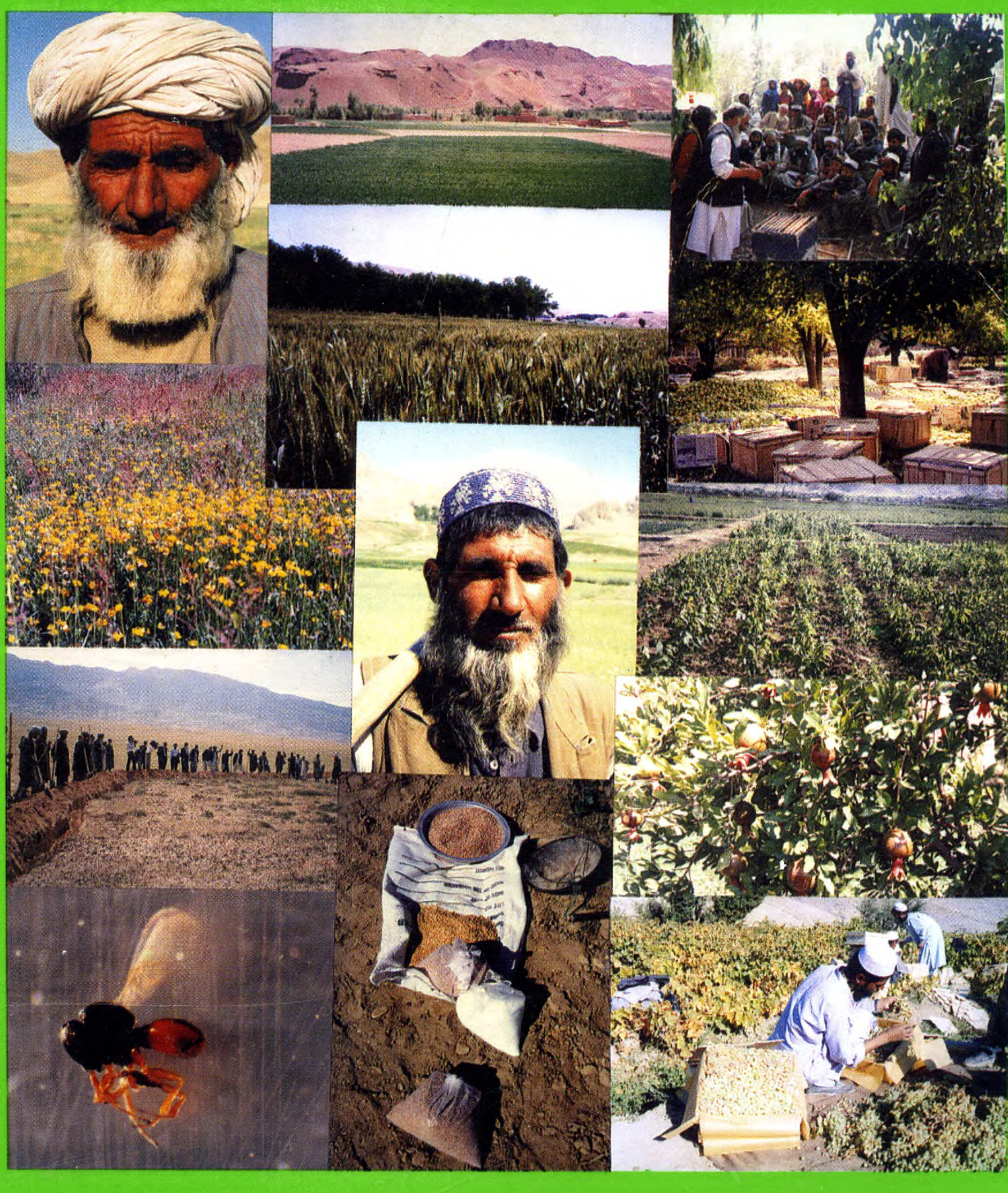
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FAO AFG/96/004, Islamabad

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